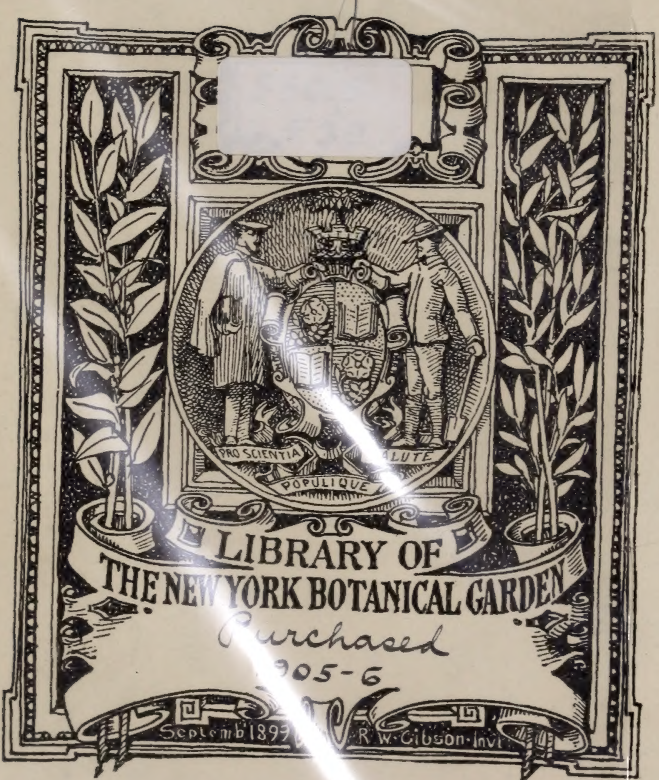

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FERN BULLETIN

A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XIII

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The Fern Bulletin

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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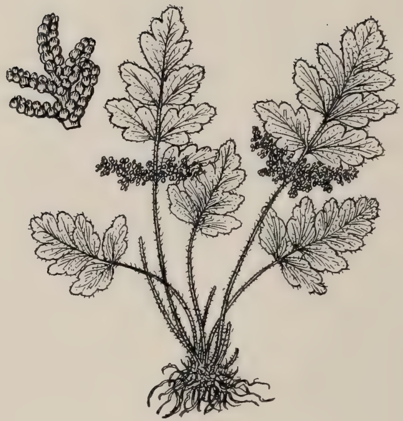

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THE FERN FLORA OF GEORGIA.

By Roland M. Harper.

Georgia is the largest State east of the Mississippi River, its land area being about 59,000 square miles. It ranges through more than four and a half degrees of latitude (30° 22′ to 35°), and about 5000 feet of altitude. As the highest points happen to be on the extreme northern border, and the lowest (the sea-coast) near the southern border, this gives the State a wide range of average annual temperature (from about 40° F. on the higher mountains to nearly 70° at the south), said to be a greater climatic range than that of any other eastern State. The average annual rainfall ranges from below 40 inches in some parts of Southeast Georgia to above 70 inches among the mountains of Northeast Georgia.

The northern half of the State, with its greater amount of shade (due partly to the more rugged topography and partly to the predominance of broad-leaved trees) and more copious rainfall, naturally contains more ferns than the southern half, where conditions less favorable for these plants prevail. As nearly all the limestone outcrops (of whatever age) in Georgia are confined to the western half of the State, we naturally find more ferns there than in the eastern half. (For the same reason Alabama has more ferns than Georgia, and South Carolina fewer.)

Georgia contains the greatest possible variety of geological formations, strata of nearly every period of the earth's history being represented. In general the oldest formations are farthest north and highest above sea-level. The natural subdivisions of the State are as follows:

About 5000 square miles in the northwestern corner are embraced in the great Appalachian Valley, which extends from Pennsylvania to Alabama. The principal topo-

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graphic features of this region are long, narrow, parallel ridges with broad, level valleys between them, all having a general north and south or northeast-southwest trend. The highest mountains in Northwest Georgia stand about 2400 feet above sea-level, and the lowest valleys about 500. The rocks of this region are all Palæozoic, ranging in age from Cambrian to Carboniferous, and are principally limestone, sandstone, and shale. Ferns seem to be more abundant here than in any other part of the State, and several species are confined to this region.

Rising abruptly from the eastern edge of the Palæozoic region, and bordered all along this line by a bold escarpment from 500 to 2000 feet high, is the mountain region proper, a part of the Blue Ridge which extends from New York to Alabama. The area of the Blue Ridge in Georgia is about the same as that of the Palæozoic region. Its highest peaks rise nearly or quite 5000 feet above sea-level, and few of the valleys descend below 1000. Topographically the mountain region is mostly a succession of peaks with numerous ridges radiating from them and narrow valleys between. The rocks are all metamorphic, and consist principally of quartzite, mica-schist, and marble. Comparatively little of the mountain region of Georgia has been explored botanically, principally on account of its relative inaccessibility. No botanist is known to have ever visited the marble outcrops, though they are well known commercially, and none are more than a few miles from a railroad. Some ferns should grow on the marble which are not found elsewhere in the Blue Ridge. Northeast Georgia of course contains some of the grandest scenery in the State, of which Tallulah Falls and Toccoa Falls (the latter considerably higher than Niagara) are well-known examples which have been visited by more than one fern student.

That part of the metamorphic region southeast of the Chattahoochee River is known as Middle Georgia. Its area is about 15,000 square miles, and it is a part of the Piedmont region which borders the mountains all the way from New Jersey to Alabama. Topographically, Middle

Georgia is everywhere more or less hilly, but not mountainous. A few isolated peaks, of which Stone Mountain (see *Bull. Torr. Bot. Club.* vol. 28, plate 29) is the best known and Kennesaw (1809 feet) the highest, rise conspicuously above the general level. The Pine Mountains in southwestern Middle Georgia (see *Bull. Torr. Bot. Club,* **30**: 292-294. 1903) are the southermost mountains in the eastern United States, and some species of ferns seem to reach their southern limits there. Middle Georgia contains all the granite of the State, and some gneiss, sandstone, etc., but no calcareous rocks, as far as known. The soil is largely a tenacious red clay, derived from the decomposition of the underlying granitic rocks, but in a few localities sand predominates. The ferns of Middle Georgia are mostly such species as grow on bare granite or in humus.

The remaining three-fifths of the State, known as South Georgia, is included in the coastal plain, which extends in a broad belt along the coast from Long Island to Mexico and up the Mississippi valley to southern Illinois. The boundary between the Piedmont region and the coastal plain is called the fall-line, because most of the rivers which cross it have falls or rapids there. This line is one of the most important natural boundaries on the continent, and in going ten miles across it we can often find more difference in the flora than in going several hundred miles parallel to it.

The geological formations of the coastal plain are Cretaceous, Tertiary, and Quaternary, each with several subdivisions. In general the oldest formations crop out farthest inland and at the highest altitude. The inland edge of the Tertiary in Georgia is about 700 feet above sea-level, but the Cretaceous region adjoining is somewhat lower, because its rocks are softer.

The rocks of the coastal plain are principally limestones of various degrees of purity and hardness (or rather impurity and softness), with some flint, and a conglomerate known as Altamaha Grit, which underlies all the middle third of South Georgia, but has not been traced beyond the boundaries of the State. But considerably over 99% of the coastal plain rocks are concealed by the superficial sands and clays of the Lafayette and Columbia formations (approximately contemporaneous with the glacial drift of the North), which form the bulk of the soils of South Georgia.

In the upper third of the coastal plain, over the Cretaceous and Eocene rocks, broad-leaved trees predominate, sheltering many of the same species of ferns as are found in Middle Georgia or even in the mountains; and where the underlying rocks are exposed (principally in the vicinity of the Flint and Chattahoochee Rivers) limestone-loving ferns are often abundant. In the remainder of the coastal plain (known as the pine-barrens or wire-grass country), open forests of long-leaf pine prevail, and ferns are scarce. During a month spent by the writer in the vicinity of Okefinokee Swamp and the neighboring coast in 1902, only eleven species of pteridophytes were noted, seven ferns and four *Lycopodiums*.

But little has been written about the ferns of Georgia outside of general works like Chapman's, Wood's and Small's "Floras," Underwood's "Native Ferns," Davenport's "Comparative Tables," Small's "Altitudinal Distribution of Ferns," and Maxon's Fern List, and a number of papers in various botanical magazines. Davenport's "Comparative Tables," published in 1883, credits 14 ferns to Georgia, two of which probably have not been collected in the State since Beyrich's time, seventy years ago.

In the FERN BULLETIN for July, 1899, I mentioned 18 Georgia ferns and 6 other pteridophytes, mostly observed by myself in Clarke County in Middle Georgia, and Sumter County in South Georgia. Since that time I have collected plants in most of the 173 counties of the State, in five different years, and have also had the use of the U. S. National Herbarium and the library and herbarium of Columbia University and of the New York Botanical Garden, with the result that I can now more than double my former list. The present paper enumerates 40 native species of ferns and 13 allies besides a few introduced species. Other botanists who have contributed to our knowledge of Georgia pteridophytes by their explorations are Dr. Chapman, who did some work many years ago in Floyd County, in the Palæozoic region, and discovered *Isoetes Engelmanni Georgiana* there; Mr. Canby, who discovered *Isoetes Melanospora* on Stone Mountain; Prof. Underwood, who has collected around Stone Mountain and Tallulah Falls; Dr. Small, who has probably explored the mountains of Northeast Georgia more than any other botanist; Mr. C. L Boynton of the Biltmore Herbarium, whose collections of Georgia ferns have been made principally from Stone Mountain to the northwest corner of the State; Prof. A. Ruth of Knoxville, Tenn., whose work in Georgia has been principally confined to Lookout Mountain and vicinity, in the Palæozoic region; Mr. Percy Wilson, who accompanied me in the northwestern quarter of the State in July and August, 1900, and paid special attention to ferns; Messrs. Pollard and Maxon of the U. S. National Herbarium, who traveled together through the western half of the State a few days in August, 1900; Mr. A. B. Seymour, who collected cryptogams in the vicinity of Tallulah Falls in 1901; Mr. B. D. Gilbert, who published some notes on ferns in the vicinity of Savannah in this journal for July, 1902; and Mrs. A. P. Taylor of Thomasville, some of whose finds have already been mentioned in these columns. I have compared notes with most of these botanists either in person or by correspondence, or both.

Except where otherwise specified, I am personally responsible for all the stations mentioned in the following list. The sequence of genera and species is that of Maxon's list (*Proc U. S. Nat. Mus.* **23**: 619-651. May 4, 1901). The nomenclature has been revised by the editor to conform as nearly as possible to that of the other State fern floras already published.

OPHIOGLOSSACEÆ.

Ophioglossum pusillum Nutt. Said by Kunze (*Am. Jour. Sci.,* II. **6**: 82. July, 1848) to have been collected at Ebenezer (in Effingham County, Southeast Georgia) by Beyrich. Apparently not seen in the State since, but it will probably turn up elsewhere near the coast when botanists get down on their knees after it.

Botrychium lunarioides Sw. (*B. biternatum* Underw.). The only direct evidence of the occurrence of this species in Georgia is a specimen from Burke County, in the coastal plain (when and by whom collected it is not stated), figured in Eaton's "Ferns of North America" (vol. 1, page 148, plate 20, figs. 3 & 8). This specimen (said to be in the Gray Herbarium) has figured in the controversies between Prof. Underwood and Mr. Davenport over this and related species.

Botrychium obliquum Muhl. Mostly in rich damp woods, fruiting in fall. Known from DeKalb (Wilson) and Clarke Counties in Middle Georgia and Sumter, Randolph and Berrien Counties in the coastal plain.

Botrychium Virginianum Sw. In rich shady woods, fruiting in spring. Frequent in the upper half of the State, and extending southward to Burke, Washington, Twiggs, Houston, and Randolph Counties in the Eocene region of the coastal plain.

HYMENOPHYLLACEÆ.

Trichomanes Petersii Gray. Reported from Tallulah Falls, near the northeastern corner of the State, 150 miles from any previously known station, by Seymour (*Torreya;* **3**: 19-21. Feb., 1903). This is our smallest and rarest fern. It has a very anomalous distribution, being known otherwise only from a few localities in the Palæozoic region of Alabama, and one in the coastal plain of Mississippi, just at the inland edge of the Upper Oligocene region (see Underwood, *Torreya,* **3**: 18. Feb., 1903). Several interesting ferns grow along this same geological boundary in Georgia, and perhaps the *Trichomanes* will turn up there too.

SCHIZÆACEÆ.

Lygodium palmatum Sw. What seems to be the first printed reference to this rare fern, (several years before it was formally described) is based on Georgia specimens. Bartram in his Travels (page 41 of the 1794 edition) speaking of the plants observed in May, 1773, along the "Great Ridge" of Middle Georgia, probably in what is now Oglethorpe County, thus describes one of them: "Malva scandens, filix scandens, perhaps a species of trichomanes; the leaves are palmated, or radiated; it climbs and roves about, on shrubs, in moist ground." On page 476 he mentions the occurrence of the same plant (calling it *Pteris scandens*) in North Carolina. This can be no other than our *Lygodium*. It has not been seen in Georgia since, apparently, but that is not very remarkable considering its well-known rarity and the scarcity of botanists in that part of the country. There are probably not half a dozen known stations for this fern in the whole South.

Lygodium Japonicum Sw. The occurrence of this exotic species as an escape in Thomas County has already been announced editorially (*American Botanist*, **5**: 36, Aug., 1903; *Fern Bull.* **11**: 106. Oct., 1903). It grows luxuriantly in roadside ditches, climbing over weeds and fruiting copiously, near a greenhouse about two miles east of Thomasville. Mrs. A. P. Taylor, who showed me this station in August, 1903, informs me that the greenhouse was burned down soon afterward, but that the *Lygodium* is still there, and stands drought as well as cold.

OSMUNDACEÆ.

Osmunda regalis L. In wet woods, throughout the State, but not common. Fruits in April. This is one of the few ferns which inhabits Okefinokee Swamp (see *Torreya*, **2**: 157. Oct., 1902).

Osmunda cinnamonea L. As widely distributed as the preceding, having about the same habitat, and fruiting at the same time; but much more frequent.

POLYPODIACEÆ.

Polypodium vulgare L. On granite and sandstone rocks in the upper half of the State. I have found it at a single station in Clarke County (probably the southernmost station in the Eastern United States), at an altitude of little more than 600 feet. (See *Bull. Torr. Bot. Club,* **27**: 30. 1900). It has also been collected at 3000 feet in Rabun County (Northeast Georgia) by Dr. Small, and at 1400 feet in Whitfield County (Northwest Georgia) by Mr. Wilson. Evergreen.

Polypodium incanum Sw. In shaded places throughout the State, but not abundant. It seems to prefer rocks wherever they are present, as has been noted by a number of botanists in the last few years, but in the coastal plain it of course usually has to take to trees. Evergreen.

Adiantum Capillus-Veneris L. Known only from Southwest Georgia, where it grows on damp shaded cliffs of Cretaceous, Eocene and Lower Oligocene limestone. (See *Fern Bull.* **7**: 65. 1899; *Bull. Torr. Bot.* Club, **27**: 425. 1900; **30**: 319. 1903; **31**:16. 1904). I have found it in the counties of Dooly, Lee, Dougherty, Quitman, Clay, Early, and Decatur. It is known from Palæozoic rocks in Virginia, Kentucky, and Tennessee, and may turn up sometime in Northwest Georgia.

Adiantum pedatum L. In rich shady woods in the cooler portions of the State. Frequent in the mountains, where several botanists have collected it. Known also from Clarke, Fulton, and Campbell Counties in Middle Georgia and Clay County in the Eocene region of the coastal plain. (See *Bull. Torr. Bot. Club,* **31**: 16. 1904). I have seen specimens from only three other coastal plain localities: Havana Glen in the Cretaceous region of Alabama, collected by Prof. Underwood (see *Bot. Gaz.* **22**: 410. 1896), but not mentioned from that part of the State by Dr. Mohr; also from Monroe County (Cretaceous) and Holmes County (Eocene) in Mississippi, the two latter collected about a dozen years ago by W. L. McGee and distributed by Prof. Tracy. Another coastal plain station for it, in Lousiana, has been reported by

Prof. Cocks in the October number of this journal. But, as was the case with the Mississippi specimens, we are not informed as to its habitat there.

ADIANTUM HISPIDULUM Sw. An exotic species, evidently an escape, growing in a well in Thomasville (see *Bull. Torr. Bot. Club*, **30**: 320. 1903), where I have observed it in three different years. Mrs. Taylor writes me that she now finds it in many wells in that vicinity.

PTERIS CRETICA L. An escape, like the preceding. Mr. S. J. Yancey of Porterdale tells me that it is common in wells in Newton County (in the Piedmont region), and there is a depauperate specimen in the Columbia University Herbarium collected in or near Augusta by H. A. Green, Nov. 13, 1893. Miss E. H. Andrews reports it from Washington, another Middle Georgia Station.

PTERIS SERRULATA L. f. In Underwood's "Native Ferns" this is reported from Macon, and its occurrence in the vicinity of Thomasville has been mentioned in the FERN BULLETIN for January, 1903. Mrs. Taylor tells me that she can hardly believe it to be an escape there. But this is not the first time that it has been suspected of being a native of the United States. (See Eaton, *Ferns of N. A.*, **2**: 240. 1880.) More evidence on this point is needed. This species is so much like the preceding that they may have been mistaken for each other in some places.

PTERIS AQUILINA PSEUDOCAUDATA Clute (*Pteris latiuscula* Desv.) Widely distributed over the State, in sandy or gravelly soil. Ascends to 3000 feet in Rabun County, according to Dr. Small. Commonest in the coastal plain, where it is abundant in dry pine-barrens.

CHEILANTHES ALABAMENSIS Kunze. According to Kunze (*Linnæa,* **20**: 5. 1847; *Am. Jour. Sci.,* II. **6**: 87. 1848), there was a specimen of this in Shuttleworth's herbarium, collected at "Capville, Upper Georgia." Capville is doubtless a misprint (caused by the old way of writing ss) for Cassville, which was at that time the county-seat of what is now Bartow County, in the Palæozoic region.

CHEILANTHES VESTITA Sw. On granite and sandstone rocks in Middle and Northwest Georgia, not rare. Ranges southward almost to the fall-line at Augusta (where it was collected by Beyrich, according to Kunze) and Columbus. The latter must be its southern limit, as there is no granite any farther south in the Eastern United States. Evergreen.

CHEILANTHES TOMENTOSA Link. Principally on sandstone rocks, in the mountains. Whitfield County (Wilson), Toccoa Falls and vicinity (Underwood, Small), Tallulah Falls (Seymour).

PELLÆA ATROPURPUREA (L) Link. On limestone or sandstone, in the western half of the State. Known from Whitfield, Walker, Gordon, and Floyd Counties in the Palæozoic region, and Randolph County in the Eocene region of the coastal plain. The latter is probably the southernmost station in the eastern United States. Besides its natural habitats I have seen it on the north side of a brick chimney of a deserted house in Tunnel Hill, Whitfield County, and on an old iron furnace in Bartow County. Dr. C. E. Waters has reported it as growing in a similar way in Maryland. It is evergreen in Georgia, however it may behave elsewhere.

WOODWARDIA VIRGINICA J. E. Smith (*Anchistea Virginica* Presl.) Confined to the coastal plain, where it is widely distributed in moist pine-barrens and shallow ponds, etc. It is essentially a light-loving species, and its fronds have been noticed to face the sun. (See Eaton, *Ferns N. A.* **2**: 46. 1880; Palmer, *Proc Biol. Soc. Wash.* **13**: 68. 1889; also *Torreya,* **2**: 157. Oct., 1902.)

WOODWARDIA ANGUSTIFOLIA J. E. Smith (*Lorinseria areolata* Presl). In wet woods, widely distributed over the State, perhaps growing in every county, but not abundant. As fond of shade as the preceding species is of light. It often grows in wells, and is about the only one of our native ferns which does so. That this and the preceding were hardly congeneric was noted 87 years ago by Nuttall.

ASPLENIUM PINNATIFIDUM Nutt. Collected on Stone

Mountain by Pollard or Maxon in 1900, and along the Etowah River near Cartersville by C. L. Boynton (see *Biltmore Bot. Stud.* **1**: 147. 1902).

ASPLENIUM EBENEUM Ait. In dry or damp shaded places, widely distributed. Common in the upper half of the State, but rather rare in the coastal plain. Reported from the vicinity of Savannah by Mr. Gilbert (*Fern Bull.* **10**: 1902), which is probably as near the coast as it gets in the South. Evergreen.

ASPLENIUM PARVULUM Mart & Gal. (*A. resiliens* Kunze.) On Cambrian, Carboniferous, Eocene, and Lower Oligocene limestone in the western half of the State, often accompanied by *Pellæa atropurpurea.* Known from Whitfield, Walker, Gordon, and Floyd Counties in the Palæozoic region and Macon, Randolph, and Decatur Counties in the coastal plain. Also reported from the vicinity of Tallulah Falls by Seymour (*Torreya*, **3**: 21. Feb., 1903), which is interesting, for that is many miles from any limestone. Evergreen.

ASPLENIUM TRICHOMANES L. Collected by Mr. Wilson, in company with the writer, on Upper Silurian sandstone rocks along the summit of Rocky Face Mountain, Whitfield County, July 21, 1900. Evergreen.

ASPLENIUM ANGUSTIFOLIUM Mx. I have seen this only once, on moist shaded cliffs of Devonian shale near the north end of Pigeon Mountain, Walker County, where Mr. Wilson secured specimens on August 3, 1900. (See *Bull. Torr. Bot. Club.* **28**: 461. 1901.)

ASPLENIUM MONTANUM Willd. Collected by both Mr. Wilson and myself at the same time and place as *A. Trichomanes.* Also in the vicinity of Tallulah Falls by Small in 1893 and Seymour in 1901, where I have seen it too. Said by Kunze to have been collected in Georgia by Beyrich. Evergreen.

ASPLENIUM BRADLEYI D. C. Eaton. On granite and sandstone rocks among the mountains of Middle and Northwest Georgia. On and near Stone Mountain it has been collected by Dr. Small (*Bull. Torr. Bot. Club*, **21**: 15, 16. 1894) and Mr. Wilson (Same, **28**: 461. 1901). Mr.

Boynton reports it from Bartow County (*Biltmore Bot. Stud.* **1**: 147. 1902). I have seen it in Whitfield County in Northwest Georgia and Walton, DeKalb, Upson, and Meriwether Counties in Middle Georgia, on mountains in every case. Evergreen.

ATHYRIUM THELYPTEROIDES Desv. Collected near Toccoa (Northeast Georgia) by Dr. Small in 1893, and reported from the State by Chapman, but locality not specified.

ATHYRIUM FILIX-FŒMINA (L.) Roth. In wet woods, widely distributed over the State, but apparently absent from thousands of square miles in the coastal plain. Near the coast it grows in Chatham County, according to Mr. Gilbert, and I have seen it in Charlton and Camden Counties, east of Okefinokee Swamp. In the upper half of the State it is quite common. I have not attempted to distinguish its varieties.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. On shaded rocks in the mountains rare. Known from Walker (see *Bull. Torr. Bot. Club,* **28**: 461. 1901) and Floyd Counties, in Northwest Georgia and collected near Blue Ridge in Fannin County by A. M. Huger in 1900. Evergreen.

PHEGOPTERIS HEXAGONOPTERA (Mx.) Fee. In rich shady woods, extending the whole length of the State on the west side. I have seen it in Fannin County near Blue Ridge, in Whitfield County in Northwest Georgia, and in Chattahoochee, Stewart, Houston, Randolph, Clay, Miller, and Decatur Counties in the coastal plain. Mr. Wilson has collected it in DeKalb County, not far from Stone Mountain. Mrs. Taylor finds it in Thomas County.

NEPHRODIUM NOVEBORACENSE Desv. In damp shady woods in the upper half of the State, rare. Grows in Whitfield County, DeKalb County (Wilson), and on the north side of the Pine Mountains in Meriwether County (see *Bull. Torr. Bot. Club,* **30**: 294. 1903).

NEPHRODIUM THELYPTERIS Desv. In damp woods, about as rare as the preceding, known only from the coastal plain. Seen once in Pulaski County, once in Sumter and once in Randolph.

NEPHRODIUM PATENS Desv. Usually on damp shaded limestone rocks, in the western half of the coastal plain, often with *Adiantum Capillus-Veneris*. I have seen it in the counties of Pulaski, Dooly, Dougherty, Clay, Early, and Decatur. At Forest Falls, in the last named county (see *Bull. Torr. Bot. Club,* **30**: 289, 319. 1903) it grows five feet tall. Mrs. Taylor has found it near Thomasville (*Fern Bull.* **11**: 14. Jan., 1903).

NEPHRODIUM FLORIDANUM Hook. In rich damp woods in the coastal plain, rare. Collected once in Sumter County and once in Berrien. Mrs. Taylor also finds it in Thomas County. Mr. A. H. Curtiss reports this (*Plant World,* **5**: 68. 1902) difficult to collect in Florida on account of "red-bugs." At both places where I have seen it I have encountered an even more exasperating entomological difficulty in the shape of mosquitoes, who, unlike the red-bugs, make their presence known immediately.

NEPHRODIUM MARGINALE Michx. On Silurian and Carboniferous sandstone and Archæan quartzite, in the mountains. Collected by Dr. Small on Stone Mountain, by Mr. Wilson on Rocky Face Mountain and by myself on Pigeon Mountain, in 1900. In November, 1903, I saw it in Rabun and Habersham Counties, in the gorge of Tallulah Falls. Evergreen.

POLYSTICHUM ACROSTICHOIDES Schott. In rich woods, nearly throughout the State except in the pine barrens. It seems to be almost always associated with the beech and white oak, and curiously enough, its whole range is just about the same as that of these two trees.

CYSTOPTERIS BULBIFERA Bernh. Collected on rocks on Lookout Mountain, by Prof. Ruth in July, 1898.

ONOCLEA SENSIBILIS L. In swamps and other places subject to inundation, in nearly every county in the upper third of the coastal plain, also in Clarke County in the Piedmont region, but nowhere abundant.

WOODSIA OBTUSA Torr. Frequent on rocks in Middle Georgia (Jackson, Clarke, DeKalb, Upson, Glascock and Muscogee Counties), also in Whitfield (Wilson) and

Gordon Counties in Northwest Georgia. In the coastal plain I have seen it twice on the shaded banks of the Chattahoochee River in Stewart County (in the Cretaceous region). This seems to be the third coastal plain station known for this species, the other two having been announced in this journal. The first is Selma, in the Cretaceous region of Alabama, reported in July, 1902, and the second is Natchez, Mississippi, on a much newer formation, reported in January, 1904. The habitats at these two outlying stations are not stated.

DICKSONIA PILOSIUSCULA Willd (*Dennstædtia punctilobula* Moore). Principally confined to the mountains. Collected in Gilmer County by Dr. Small in 1895, on Lookout Mountain by Prof. Ruth in 1898, and in DeKalb County by Pollard or Maxon in 1900. On Sept. 30, 1903, I saw it from a train in Fannin County.

EQUISETACEÆ.

EQUISETUM HIEMALE ROBUSTUM A. A. Eaton. In clayey soil near Lafayette, Walker County (see *Bull. Torr. Bot. Club,* **28**: 461. 1901), also on wet Cretaceous rocks on the bank of the Chattahoochee River in Quitman County, in the coastal plain. Reported by Chapman from the "Banks of the Chattahoochee River, Georgia," but whether he saw it at the same place I did or not cannot now be ascertained.

LYCOPODIACEÆ.

LYCOPODIUM ALOPECUROIDES L. In sandy bogs, nearly throughout the coastal plain.

LYCOPODIUM ALOPECUROIDES ADPRESSUM Chapm. (*Lycopodium Chapmani* Underw). In sandy bogs in the coastal plain, not common. Seen in Sumter and Charlton Counties.

LYCOPODIUM ALOPECUROIDES PINNATUM Chapm. (*Lycopodium pinnatum* Lloyd & Underw). In similar places to the preceding, mostly in the pine-barrens, but commoner. McIntosh County (Small). Sumter, Irwin, Coffee, Berrien, Colquitt, Decatur and Ware Counties. Also in Meriwether County in the Piedmont region, an exceptional station (see *Bull. Torr. Bot. Club*, **30**:294. 1903).

LYCOPODIUM CAROLINIANUM L. Often with one of the preceding, but rather rare and less conspicuous. Sumter, Emanuel, Tattnall, Coffee, Irwin, Colquitt, Decatur and Charlton Counties.

LYCOPODIUM CERNUUM L. In moist railroad cuts, in the southern part of Randolph County, Oct. 28, 1902. Evidently introduced. (See *Torreya*, **3**:90. June, 1903).

SELAGINELLACEÆ.

SELAGINELLA RUPESTRIS Spring. On granite rocks, Kennesaw Mountain, Cobb County (see *Bull. Torr. Bot. Club*, **28**:461. 1901), and near the fall-line in Muscogee County. Both of these stations seem to be farther south than any others known in the Eastern United States, also collected on Currahee Mountain, Habersham County by Dr. Small.

SELAGINELLA ARENICOLA Underw. I have found this only on dry exposed outcrops of Altamaha Grit in Tattnall County. (For a photograph of one of these places see *Torreya*, **4**:140. Sept., 1904). Mr. Curtiss has collected it in "Dry sandy open ground, among sparse herbage, near Bainbridge," Decatur County.

SELAGINELLA ACANTHONOTA Underw. On sand-hills along the Altamaha River and its tributaries in Tattnall, Montgomery and Liberty Counties, in Southeast Georgia. Also on an Altamaha Grit outcrop in Dooly County.

SELAGINELLA APUS Spring. Mostly in damp woods or meadows, not common. Whitfield and Walker Counties in Northwest Georgia (Wilson), Clarke County in Middle Georgia, and several counties in the Northern and Western part of the coastal plain.

ISOETACEÆ.

Isoetes melanospora Engelm. An endemic species, known nowhere else than DeKalb County, where it has been collected in shallow pools on top of Stone Mountain by Canby, Underwood, Small and Boynton, and in similar places on Little Stone Mountain by Small (see *Bull. Torr. Bot. Club,* **21**:300. 1894).

Isoetes Engelmanni Georgiana Engelm. Also endemic to Georgia, as far as known. But Mr. Eaton considers this variety hardly worth maintaining, as its extremes overlap those of the species. Two stations are on record, both in the Palaeozoic region. It was discovered by Dr. Chapman in Horseleg Creek, Floyd County, and I found it once in Whitfield County (see *Bull. Torr. Bot. Club,* **28**:462. 1901). On Jan. 4, 1904, I sought to re-discover the type-locality, and followed Horseleg Creek from its mouth as far up as there was any water in it at that time, a distance of about a mile. The creek was very low, the water clear, and the bottom everywhere visible; and several other aquatic plants were seen and recognized, but no trace of any *Isoetes.*

Isoetes flaccida Shuttl. In swamps of pine-barren streams in the coastal plain; amphibious. Collected by the writer in Laurens, Sumter, Bulloch and Coffee Counties, and doubtless grows in many other places in South Georgia. The var. *rigida* grows in pine-barren ponds in Sumter County, and is distinct enough in habitat, if in no other way. (See *Bull. Torr. Bot. Club,* **30**:320. 1903).

Isoetes Butleri Engelm. Palæozoic region. Reported from "Chickamauga Park, Dade County," by C. L. Boynton (*Biltmore Bot. Stud.* **1**:147. 1902), but Chickamauga Park is not in Dade County.

The following species have been reported from Georgia, or from states on both sides of it, but definite stations for them are not known.

Ophioglossum vulgatum L. Said to range southward to Florida.

Ophioglossum crotalophoroides Walt. Credited to

Georgia by Wood. This species will almost certainly turn up in the State, for it has been collected in the three states whose coastal plains adjoin that of Georgia.

Nephrodium spinulosum dilatatum Baker. Credited to the State in Small's Flora, but I cannot find any specimens to substantiate this.

Cystopteris fragilis Bernh. Credited to Georgia in Maxon's list and Chapman's and Small's Floras, and Dr. Small is sure he has seen it in the State, but does not remember where. It grows in the Mountains if anywhere.

Azolla Caroliniana Willd. Said to range from New York to Florida, etc. To be expected near the coast.

Lycopodium obscurum L. Credited to Georgia in Small's Flora.

Psilotum triquetrum Sw. Has been collected in South Carolina and Florida, but not yet detected in Georgia.

Trichomanes radicans and *Scolopendrium vulgare* may turn up in Northwest Georgia some time, for they have been found not very far from there.

College Point, N. Y.

A NEW TYPE OF ANEIMIA.

By George E. Davenport.

With Plate by Chas. E. Faxon.

The discovery of a new fern always awakens pleasurable emotions in the minds of fern lovers, and next to the enjoyment of finding a new plant for one's self is that felicity of unselfishness which finds pleasure in the discoveries of others. But when, as in the present instance, the discovery brings to light not only a new species, but the type for a new section in an established genus, our emotions become doubly pleasurable. It is therefore with no little pleasure that I introduce to the readers of the Fern Bulletin one of the most interesting fern plants that has been found since the discovery of that very remarkable fern *Trochopteris elegans* Gardner, in Brazil, in 1840, and which remains to this time the only representative of a genus that was created expressly for it.

The Brazilian plant is unquestionably the most remarkable fern known. It grows in a circular rosette-like form scarcely more than two inches in diameter, with the small round-lobed fronds lying perfectly flat one above the other, and arranged with their bases attached to the central tuft exactly as the spokes of a wheel are arranged around its revolving axis. Hence the derivation of the name *Trochopteris*—*Trocho*—from the Greek for a wheel, and *pteris*, a fern. The plant itself would never be taken for a fern, so unlike is it in every way, if it was not for the character of the fruit which it bears on the laciniated edges of its lowermost lobes, and which consists of *Aneimia*-like sporangia and spores. An interesting historical account and description of this curious fern plant, with illustrations, may be found in Hooker's "London Journal of Botany," Volume I (1842), p. 74. t. 74. There is also a beautiful analysis in color in Hooker and Bauer's "Genera" (104) and in "Synopsis Filicum," Plate VIII, p 67; and a fairly good specimen of the plant itself exists in the Gray Herbarium at Cambridge.

Our new plant, which comes from Mexico, while wholly different in its mode of growth, bears some resemblance to *Trochopteris* in its habit of bearing fruit on its lowermost divisions instead of on an elongated panicle distinct from the lamina as in typical *Ancimia* itself. A very careful examination of the sporangia and spores however shows that it is a very distinct small *Ancimia* with an entirely different habit of fruiting from any known species, and it might very properly be treated as forming the nucleus for a new section. It appears to be the smallest *Ancimia* yet discovered, the largest fronds being scarcely more than two, or two and a quarter inches long, and one-half of this is taken up by the stipe. The distinctive character of the plant lies in its changed lower pair of pinnæ, these being completely transformed into distinct sporophylls resembling the small branches of a typical *Ancimia* panicle. Kunze was of the opinion that the genus *Ancimia* was characterized by the uniform character of its spores, and judging from my own examination of the spores in *A. adiantifolia*, *A. hirsuta* and *A. tomentosa*, in connection with our new species, this would seem to be the case.

In "Ferns of North America," Prof. Eaton described the spores of *Ancimia* as being special objects of great beauty for microscopical study, and such I found them to be. The sporangia, or capsules, are still more beautiful, showing quite a range of color through the reds and yellows in their rings, or caps, while the body of the capsule is beautifully reticulated and transparent, showing imprisoned spores very plainly. In the new fern the cap is a brilliant orange-scarlet.

It gives me much pleasure to dedicate this unique and interesting fern to one who has made so many valuable additions to botanical science, and who is to be congratulated on the present one:

The new species will go under Hooker's EUANEIMIA, but on account of its different manner of fruiting some readjustment is necessary in order to make room for it, and the following arrangement is submitted:

EUANEIMIA: sterile and fertile portions on the same frond, veins free.

Paniculatae.

* *Sporophyte* variable in size and cutting, but all with distinct, long-stalked elongated *sporophylls*, embracing species 1 to 18 of "Synopsis Filicum" (H. & B., 1874).

Non Paniculatae.

** *Sporophyte* small, *sporophylls* without stalks, consisting of the changed lowermost pair of pinnæ:—

ANEIMIA BRANDEGEEA Davenport, n. sp.

Dedicated to Townshend Stith Brandegee.

Sporophyte small, about 2 inches high, tufted; *fronds* equally divided, the *lamina* and *stipes* being of nearly equal length; *laminæ* oblong-ovate, approximately 1⅛ in. long, ¾ wide in the broadest part, the upper half obliquely pinnatifid, the lower half pinnate with oblong pinnatifid pinnæ, the uppermost pair sessile, the second pair slightly stalked, the lowermost pair pinnately branched and transformed into distinct *sporophylls*. This being its distinctive character. Sporangia ovoid, or pyriform, reticulated, the cap, under the microscope, bright orange-scarlet. Spores roundish-tetrahedral, ribbed. Texture herbaceous, venation flabellate, whole plant hirsute.

Habitat: Face of perpendicular cliffs. Cerro Colorado, vicinity of Culiacan, Sinaloa, Mexico. T. S. Brandegee, Nov. 5, 1904.

This unique fern is apparently rare. A small colony of some two dozen plants only was found occupying a space scarcely more than a foot square in about an inch of soil six feet from the base of the cliff on which they grew. The plant from which Mr. Faxon's drawing was made has been deposited in the Gray Herbarium at Cambridge as the type.

I have followed the orthography adopted by Prof. Daniel C. Eaton, whose fine reputation as a Greek scholar made his judgment especially valuable in such matters. Swartz wrote *Anemia,* and that orthography has been adopted by most authors since, but Kaulfuss pointed out the error in the Greek word which led to it and corrected the spelling, and in this he has been followed by some others besides Prof. Eaton. The genus was first proposed by Prof. Swartz in 1806 (Synopsis Filicum), and has become so firmly established that it is folly to attempt to supersede it by Bernhardi's *Ornithopteris,* even if it could be shown—which has not yet been done—that the name did antedate *Aneimia.* But it has not been used since within the limits of the Berlin rule, and has no legitimate standing. The exceedingly weak evidence furnished by the mere reference in Swartz's Index is not sufficient to re-establish Bernhardi's name, as it cannot be shown that it did really appear before that portion of Swartz's work which described *Aneimia* was printed.

Medford, Mass., Jan. 10, 1905. G. E. D.

EQUISETUM SCIRPOIDES IN ILLINOIS.

By E. J. Hill.

In Patterson's "Catalogue of the Plants of Illinois" (Oquawka, Ill., 1876), but one station was given for this *Equisetum*—Ringwood, McHenry County, on the northern border of the State. The authority was Dr. George Vasey, who resided at Ringwood for a while. It is the only published reference to a definite locality in the State that I have seen. In the winter of 1904, Dr. H. C. Cowles, of The University of Chicago, showed me some specimens he had found the summer preceding in a ravine at Lake Forest. Looking for it in the locality indicated, I did not find it, though its nearest ally in our flora, *Equisetum variegatum,* was present in considerable quantities. This latter is a common plant in the moist sands of portions of the dune region at the head of Lake Michigan, and in a similar small dune area near Waukegan, below Lake Forest on the lake shore.

In November, 1904, however, when searching some ravines for Bryophytes, I came across *E. scirpoides* in great abundance in a ravine at Lake Bluff, about a mile north of the locality mentioned by Dr. Cowles. It was apparently confined to a well-shaded slope facing the north, and occurred in tufts and patches for a distance of several rods. It was also more copiously represented than I remember seing it in any station in Michigan where I had previously collected it. The larger patches, two or three feet across, make a compact turf in which thousands of the little slender stems are represented. The ravine is one of a great number of like kind cut deep down in the thick drift by the small streams which drain the narrow slope bordering Lake Michigan north of Chicago. They are wooded, shady, and cool, and midway to the bottom or below moist or even wet in spots. Water oozes out of layers of sand or gravel in the prevalent clay of the drift, sometimes forming small and perennial springs. The finest growth of the *Equisetum* was in a wet place, where such a lover of moisture as *Fegatella conica* shared the ground with it. The stems were six to nine inches high. In dryer spots the tufts are smaller, with a half-dozen to a handful of stems, and with an average height of three to five inches.

Though primarily a mesophyte, *E. scirpoides* may endure quite xerophyte conditions. I have found it at Northpost, Mich., rooting in stumps and fallen logs, and fruiting at the height of two inches. Close by, however, was a growing terrace of peat-moss, built up by springs. At Marquette I have collected it on rocky, wooded hills, quite dry, but shady and cool. The plant in these ravines is not alone in its mixed ecologic character, nor as a representative of a more northern flora. In their upper reaches the clay becomes hard and dry, with flora of a more xerophytic aspect, in their lower parts the plants are mesophytic. The red cedar, the white cedar, white pine, paper birch, buffalo berry (*Shepherdia Canadensis*), grow intermixed or in close proximity, and large feather-moss (*Hylocomium triquetrum*), common in pine woods and pine plains to the north, carpets the ground in places.

These stations of *E. scirpoides* are of interest as they mark about its southern limits for the region. It is given in the Michigan flora as occurring in Macomb County, contiguous to Lake St. Clair. This, and the station at Ringwood, are essentially on the same parallel, only a few miles north of there by the shore of Lake Michigan.

Chicago, Ill.

ILLINOIS FERNS NEAR LAKE MICHIGAN.

By Mary Lee Van Hook.

I had never thought of this part of Illinois as a home for many ferns. On the cliffs and in the ravines of the Rock River, or perhaps in the southern part of the State, there would be ferns, but here so near the Lake and Chicago, surely not. Ferns to me suggested the North Woods where I had spent a summer, or a primeval forest in Montana which I once visited. In these places I had found ferns in abundance, ferns not in the least shy, but as usual as trees or flowering plants. Now it was that I began to look for ferns in this region, for here they must be sought. I found not only the ferns, but great joy in the hunting. In the early morning to go into the woods sweet with the odor of damp earth and the pungent, medicinal smell of the witch-hazel, now, in the fall, so surprisingly covered with yellow blossoms, surely that is enough in itself. But to make your way through a tangle of sassafras and hazelnut and coming out suddenly into an open space discover masses of lacey ferns, a tropical garden of the fairies, this is ideal!

In such an open space, especially if it is low-lying, one most often finds the cinnamon fern (*Osmunda cinnamomea*), the handsome fronds in a crown, very often two feet or more in height. The deeply-cut pinnæ give the fronds a leafy effect which in ferns growing in the shade becomes even more leafy. Just as in other plants, there is the difference in appearance in ferns found growing in in the sun from those in the shade: the former are always more contracted in the effort all plants make to reduce their radiating surface where there is the fear of too much transpiration. In similar places to that in which the cinnamon fern is found one comes upon the royal fern (*Osmunda regalis*), and also the interrupted fern (*Osmunda Claytoniana*). The royal fern is least of any like a fern in appearance, but resembles some plant belonging to the pulse family, an effect produced by the vivid green of the fronds and their compound cutting.

In the open, sunny places, where usually the ground is low and has been in the spring partly a swamp, the sensitive fern stretches its coarse luxuriance. The large tropical looking fronds are rather handsome, especially late in the fall when the veins have turned a rich red in color as if they hoped to be warmer against the coming cold weather.

The common brake (*Pteris aquilina*), though preferring the dryer, open places, is found pretty much everywhere. Though coarse looking, it is, in its way, handsome, with its long stipes supporting the broadly triangular fronds of dark green. Although such a hardy fern, it has been most difficult to transplant, the pinnules withering directly, regardless of the care taken to furnish the plants with water immediately. It is true the rootstock is deep and it is hard to procure specimens without breaking them, but other ferns, the *Osmundas* in particular, make no complaint at this. Later on, in roaming the woods, the blackened remains of *Pteris* is one of the most frequent sights.

In the damper portions of the woods the marsh fern (*Aspidium thelypteris*), grows abundantly, usually a great deal of it being found in one place. Next usual in this region is *Asplenium filix-fœmina,* the lady fern. The rootstock of this fern is not deep and it is easily and successfully transplanted. The maidenhair (*Adiantum pedatum*), is found in clumps in the damp, shady places.

Aspidium spinulosum is not at all uncommon in these woods. It loves the shade, and besides seeking a wooded spot, it usually nestles at the base of an old stump or grows near the roots of a tree. The crested fern (*Aspidium cristatum*), is sometimes found, its narrow, blue green fronds rendering it unmistakable. It has habits much the same as those of *A. spinulosum,* and in the most secluded spot one may come upon this beautiful fern. I have often thought there might be some other object than the securing of shade in this love of some ferns for the base of the trunks. Many love to grow on the roots of trees, and often in transplanting ferns one can scarcely extricate the rootstock of the fern from the roots of other plants. They probably obtain moisture and some nourishment in this way. *Aspidium spinulosum* and *A. cristatum* are often found growing on decayed wood, and especially love an old stump; it may be that their nature is in part saprophytic, that the decaying vegetation satisfies some need that they have. Visiting the woods in the latter part of November, I found both species retaining their color perfectly and looking entirely fresh. The stipes were bent, however, and the fronds, for the most part, reclined on the ground. Even under the snow, as late as Christmas, these evergreen ferns keep their color.

In less wooded spots, the grape fern (*Botrychium obliquum*), lifts its two branches from one stalk, the one frond leafy and sterile, the other fertile and terminating in the grape-like fruit. Here also is found *B. Virginianum*, or the rattlesnake fern, looking very like *B. obliquum*, but always distinct in the fall, from its absence of fruit, which appears in the spring.

The small trailing bladder fern, fond of wet woods, is occasionally found and one woodland is productive of the broad beech fern (*Phegopteris hexagonopteris*). This last species bears transplanting well, though were it more trouble, the beautiful triangular fronds with decurrent lower pinnæ, would be worth it all. Fourteen species of ferns in all, though none of them rare, from a region thought to be unproductive of any fern, amply reward a patient search.

Lakeside, Ill.

ADDITIONAL SETS OF THE FERN BULLETIN.

The publication in the October number of the names of the fortunate owners of complete files of THE FERN BULLETIN has brought to light the whereabouts of five more full sets. Prof. J. C. Arthur, of Perdue University, Lafayette, Ind., writes that he now has a full set, completed at considerable expense. Mr. Chas. D. Lippincott, Swedesboro, N. J., has been a subscriber since the beginning, and writes that he has all the numbers. Miss Elmira E. Noyes, Portsmouth, Va., as a member of the Fern Chapter since 1893, has received and preserved a full file. Mrs. Judith H. Coffin, Newburyport, Mass., and Mrs. E. H. Terry, Northampton, Mass., also have complete files. If there are any others who have complete sets we hope to hear from them when this note is read. Thus far but fifteen sets have been located. It may be of interest to know that 300 copies of each of the first twelve numbers were issued. Four hundred copies of Vol. IV. were issued, and five hundred of Vol. V. Volume VI consisted of seven hundred copies of each issue, but there are now left in the publisher's hands but eighteen sets of this volume.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CLUTE, W. N. *Adiantum Capillus-Veneris in Pennsylvania.* Fern Bulletin, O. 1904.

CLUTE, W. N. *The Jamaican Walking Fern.* Fern Bulletin. Illust. O. 1904.

COCKS, R. S. *Notes from Louisiana.* Fern Bulletin, O. 1904.

DUKES, W. C. *Fall Fruiting of Osmunda.* Fern Bulletin, O. 1904.

DUKES, W. C. *Babyhood of Ferns.* Fern Bulletin, O. 1904.

Eaton, A. A. *Pellæa Ornithopus.* Fern Bulletin, O. 1904.

Fitzpatrick, T. J. *The Fern-flora of Montana.* Fern Bulletin, O. 1904.

Fitzpatrick, T. J. *The Fern-flora of Montana.* Fern Bulletin, O. 1904.

Foster, A. S. *The Broad Wood Fern in Washington.* Fern Bulletin, O. 1904.

Hahne A. H. *Current Literature Relating to Ferns.* Fern Bulletin, O. 1904.

Hahne, A. H. *Forking Ferns.* Fern Bulletin, O. 1904.

Kellerman, W. A., and Gleason, H. A. *Notes on the Ohio Ferns.* Ohio Naturalist, N. 1904.

Klugh, A. B. *The Flora of the Puslinch Lake District.* Guelph Herald, N. 18, 1904.

Maxon, W. R. *Notes on American Ferns—VII.* Fern Bulletin, O. 1904.

Phelps, O. P. *New Stations for Two Rare Connecticut Ferns.* Fern Bulletin, O. 1904.

Schneck, J. *Asplenium Ruta-muraria on the Towers of Milan Cathedral.* Fern Bulletin, O. 1904.

Tilton, G. H. *An Addition to the Fern-flora of Vermont.* Rhodora, D. 1904.

Woolson, G. A. *Nephrodium Pittsfordensis.* Fern Bulletin, O. 1904.

EDITORIAL.

Some time ago it occurred to the editor that the FERN BULLETIN had been running long enough in one form to deserve a change, and the present little surprise in cover and text is the result. We doubt if some of our recent subscribers will recognize the magazine at first sight, but the old patrons have become somewhat used to things of this kind. Three times has the size of the page changed, growing larger with age, but we are not going to enlarge in that way again even if some of the wiseacres do consider small size and insignificance synonymous. In the other direction the magazine has grown immensely, for it started as a four-page affair and grew by the addition of four pages at a time until its present size was reached.

* * *

There may be some who are inclined to think that the delays in issuing recent numbers indicates that the magazine is fast approaching a point where an early suspension of publication may be expected. Such, however, is far from our ideas on the subject. We are too proud of our claim to being the third oldest botanical publication in America, to stop now, even if the large number of new subscribers that have recently joined us, has not indicated that the magazine's field of usefulness has not narrowed in the least. We do not expect to suspend until all the others have ceased from troubling. The chief cause for the irregular appearance of the magazine is the fact that the editor is away from home teaching biology in a city high school, and thus cannot always arrange to have the number issued on time.

* * *

A few days ago a correspondent wrote that since no new species had been discovered and no extensions of range reported, he had nothing to write about for publication. It is true that the species-tinkers and name-jugglers have probably done their worst with American ferns; but the fact that there are no more new names or "new species" to discuss is no reason for imagining the study of ferns to be languishing. No one can become a true student of any science until he gets over the delusion that the learn-ing of the names is the end and aim of the study. Who cannot recall instances of people who call themselves botanists, ornithologists or entomologists upon the strength of knowing the mere names of a greater or less number of plants, birds or insects! The true study is far different. Thoreau has aptly expressed it regarding ferns when he says: "If it were required to know the position of the fruit dots or the character of the indusium, nothing could be easier than to ascertain it; but if it is required that you be affected by ferns, that they signify anything to you, that they be another sacred scripture to you, helping to redeem your life, this end is not so easily accomplished." There are yet great possibilities open to the student of ferns!

* * *

It is a question whether there ever would have been a FERN BULLETIN if there had not been a Fern chapter. Certainly the one grew out of the other. Both have had unique careers. There probably is no other botanical society of the Fern chapter's size in the world that has maintained an uninterrupted existence for more than twelve years without holding regular meetings. Its membership includes every prominent student of ferns in America, and its officers have always been men of ability selected for their activity in the study of ferns. Younger students value membership for the opportunities it offers to exchange specimens, and for the help they are able to obtain on difficult points, while to older members it is quite as valuable, since an intelligent audience is thus provided for the reception of their own discoveries. In times gone by many rare and interesting ferns have been distributed to members, while the acquaintances formed through correspondence have in many cases ripened into firm and lasting friendships. It is probable that the Fern chapter and the FERN BULLETIN will grow old together, but we trust it will be a long time before either shows signs of decrepitude.

* * *

We have upon our lists the names of people whose subscriptions are paid to the end of 1908, while those who have paid to the end of 1906 are plentiful. We take this as rather complimentary to the magazine, since it indicates that they are confident that we will not only continue to exist for some years more, but continue to publish what is interesting to fern lovers. Upon these two points we are confident that they have made no mistake. But there is also a business side to the question. By paying for more than one year, you are saved the trouble of the annual remittance. If there are any others who care to pay some distance in advance, we offer the magazine for two years for $1.25, and for three years for $1.75. These prices are strictly in advance.

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It is commonly asserted that the Hart'stongue (*Scolopendrium*) occasionally roots at the tips. Mr. Chas. T. Druery, however, writes that he has never seen fronds of this kind in Great Britain, although the fern is abundant there, and he is always on the watch for aberrant forms. If any reader can refer us to any published account of this fern rooting at the tips of the fronds, we shall be greatly obliged. We feel sure that such an account has appeared, but fail to locate it at this writing.

NOTES.

Dr. K. Rosenstock, Gotha, Germany, has given notice that he will soon issue centuries of exotic ferns, beginning with the ferns of Southern Brazil. The first century will appear in 1905, and will be sold for $10.00.

In the *Botanical Gazette* for December, E. B. Copeland discusses at some length " The Variations of Some California Plants," in which figures of two variant ferns are given. The author does not agree with the mutation theory of the origin of species, and ends by saying: " 'Mutations,' or discontinuous variations, and the most insignificant of individual variations are parts of one unbroken series."

Mr. R. M. Harper writes regarding the fall fruiting of *Osmunda* that in August, 1896 he collected fruiting specimens in Sumter County, Ga. The place where they grew had recently been burned over. He suggests that Prof. Cocks may obtain a hint of promising locations for *Adiantum capillus-veneris* by consulting the reports on the geology of Louisiana. Mr. Harper found one of the best stations for this fern in Georgia in this way.

Mr. E. P. St. John calls our attention to the statement in an old number of *Garden and Forest* that *Nephrodium fragrans* is found in the Shawangunk Mountains of Southeastern New York. The elevations in these mountains seldom rise above 2000 feet, and it is probable that some other fern—possibly the *Dicksonia*—has been mistaken for its rarer ally; though it may be that the other is really found there. Mr. St. John, however, failed to find it. *Dicksonia* has often been mistaken for the fragrant shield fern. In Millspaugh and Nuttall's "Flora of West Virginia" the statement is made that the fragrant shield fern is so plentiful on the mountains as to be cut for hay. Of course this is the *Dicksonia*.

BOOK NEWS.

The twenty-first volume of John Lane's Hand-books of Practical Gardening is entitled "The Book of the Iris," * by Irwin Lynch. In this excellent volume, "the poor man's orchid" is treated principally from the cultural standpoint, and little if anything is left unsaid that will assist the amateur to grow these handsome flowers. The book begins with the natural history of the plant, discusses the Iris garden and the growing of the flowers, and treats of the diseases and insects that trouble them. The second part deals with classification, and includes descriptions of all the species and hybrids known in cultivation, with keys for their identification. There are thirty-six illustrations from photographs.

Teachers of nature-study will be interested in a little book entitled "How Nature Study Should be Taught." † The author is Dr. E. F. Bigelow, well and favorably known to the nature-loving public as an entertaining lecturer and writer on out-door themes, and nature editor of St. Nicholas. The author takes the ground that nature-study is not elementary science, and urges that the teacher look at the subject with the child's eyes from the child's standpoint. The book can scarcely be called a guide to nature-study; it is rather a series of readable chapters which will give the teacher new viewpoints.

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* The Book of the Iris, by Irwin Lynch. New York, John Lane, 1904, 214 pp., $1.00.

† How Nature Study Should be Taught, by Edward F. Bigelow. New York, Hinds, Noble & Eldredge, 1904. Pp. 203, $1.25.

N. Hudson Moore's "Flower Fables and Fancies"* treats of Chrysanthemums, Lilacs, Roses, Lilies, Violets, Tulips, Daffodils, and Crocuses, and what poets, essayists, and botanists have said about them. The text on each page is margined with flower designs in tint, which add not a little to the attractiveness of the book. The text makes no pretensions to completeness, but is well worth a reading.

THE LINNÆAN FERN CHAPTER

OF THE AGASSIZ ASSOCIATION

A copy of the ten-year Index to the FERN BULLETIN has been mailed to all members of the Chapter whose dues are paid for 1904.—C.

It may be news to some members that the new President of the Chapter is also National Chairman of the People's Party. He also rejoices in the unique distinction of having a greater number of American ferns species in cultivation than anyone else in America, botanical gardens included.

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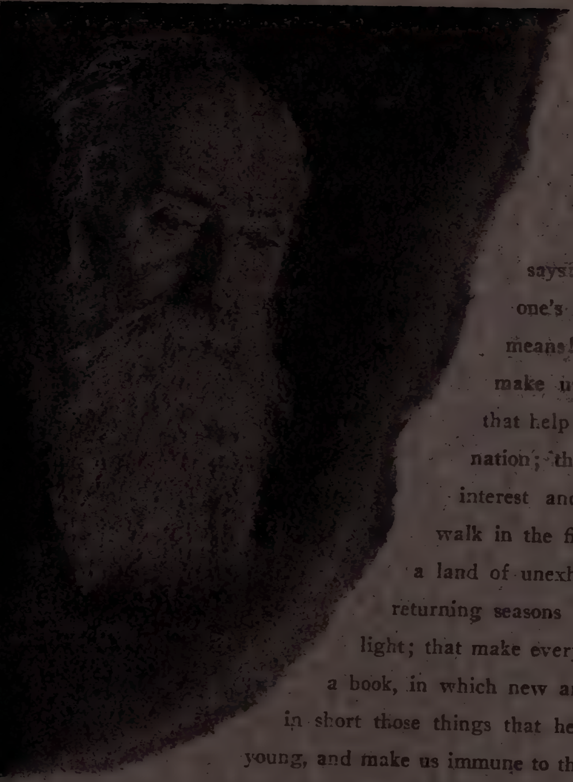
* Flower Fables and Fancies, by N. Hudson Moore. New York, The F. A. Stokes Co., 1904. 12mo., pp. 192. $1.60 *net.*



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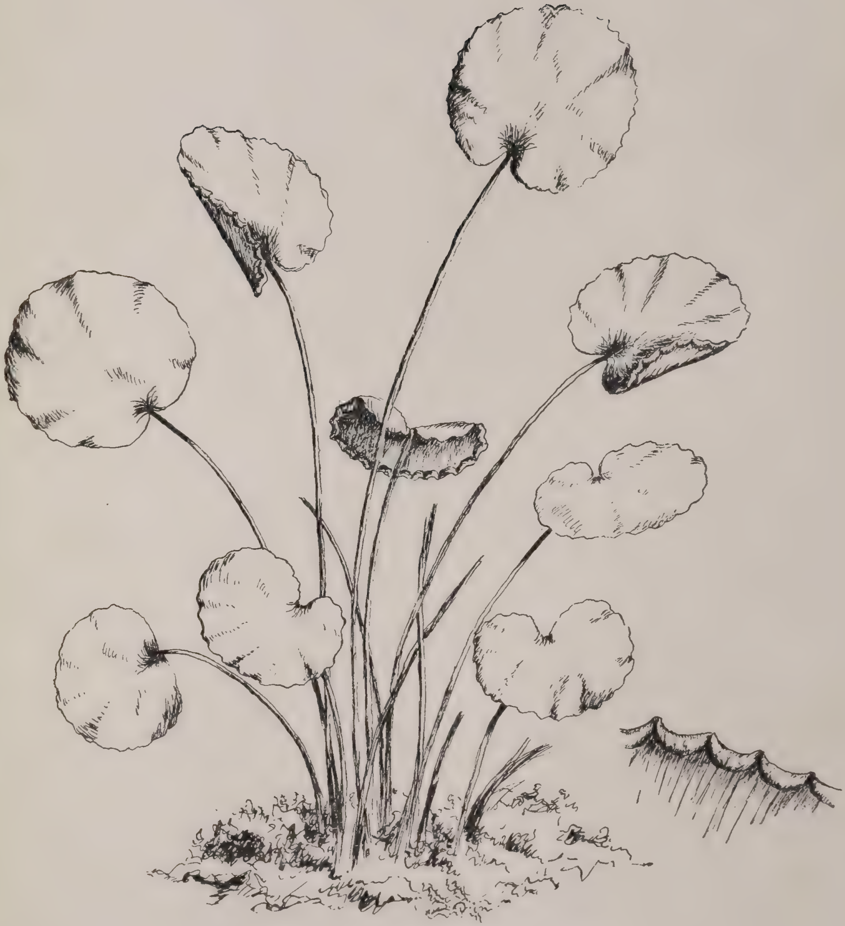

ADIANTUM RENIFORME

THE FERN BULLETIN

Vol. XIII. APRIL, 1905. No. 2

THE FERN FLORA OF VERMONT

LIBRARY NEW YORK BOTANICAL GARDEN

By W. W. Eggleston.

Vermont's small area produces a surprising number of fern species. Although having a range north and south of only about two degrees, there is a difference in altitude from one hundred feet about Lake Champlain to over four thousand five hundred feet at the summit of Mt. Mansfield. This range in altitude gives more northern species than the higher Adirondacks, the White Mountains, or the mountains of Maine. Comparing the remainder of New England with more than five times the area, a long seacoast, much higher mountains, and greater range of latitude both north and south, we find that Vermont has but one fern less, or fifty-eight species in all. New England has *Lygodium palmatum, Asplenium montanum, Woodwardia angustifolia, Cheilanthes lanosa,* and *Botrychium Onondagense,* unknown to Vermont. In compensation Vermont has *Woodsia alpina, Asplenium viride, Pteris aquilina pseudocaudata,* and *Botrychium Lunaria.* New York, with about the area of New England but a more southern range, has sixty-three species. Incidentally New York and all New England each have sixty-three species, New England's *Asplenium viride* and *Botrychium Lunaria* (from Vermont) counterbalancing *Asplenium Bradleyi* and *Scolopendrium vulgare.* Of ferns and fern allies Vermont has eighty-two species and varieties. New York, with five times the area, has eighty-three; California, with seventeen times the area, eighty-one, and Texas, with twenty-seven times the area, sixty-six.

Vermont is separated into two main divisions by the Green Mountains running north and south through about the middle of the State. Western Vermont with

27 1905

a much lower altitude, and the Taconic range of mountains bringing in southern and western forms, has the larger flora; here belong *Asplenium ebenoides, Pteris aquilina pseudocaudata, Woodwardia Virginica, Pellœa atropurpurea,* and *Asplenium Ruta-muraria,* with the exception of the Willoughby station of the latter two. Eastern Vermont has *Botrychium Lunaria* and *Nephrodium simulatum,* but such forms as *Botrychium lanceolatum, Camptosorus, Phegopteris hexagonoptera,* and *Woodsia obtusa* are very uncommon, and found only at low altitudes in the lower Connecticut valley.

The State presents four sharp areas. (1) Western Vermont, a lowland region, including the Champlain valley and its lower tributaries and those of the Hudson River, in southern Vermont. The finest fern localities of this region are the limestone cliffs and river gorges. Here grow *Pellœa atropurpurea, Asplenium ebeneum, A. ebenoides, A. trichomanes, A. Ruta-muraria, Camptosorus, Woodsia obtusa, Pellœa gracilis, Cystopteris bulbifera,* etc.

(2) The lowlands of the lower Connecticut valley, with traces of limestone in places, producing a fine flora.

(3) The Green Mountain region. In this I include the country above one thousand feet, or at least two-thirds of the State. This region has only about one-half of the species, but here belong *Polystichum Braunii, Nephrodium spinulosum dilatatum,* and *Phegopteris polypodioides.*

(4) The alpine and sub-alpine cliffs, and with them the deep river gorge, Quechee Gulf. These produce *Asplenium viride, Woodsia glabella, Woodsia alpina,* and *Nephrodium fragrans.*

Within a few years our State has been very closely searched for ferns. This movement was begun by C. G. Pringle, his work being particularly strong on the alpine forms, and to Pres. Ezra Brainerd we owe much of our knowledge of *Botrychium.*

There has been much rivalry in several localities, started by Miss Margaret Slosson and G. A. Woolson at Pittsford. In the FERN BULLETIN, July, 1898, Miss Slosson reports forty-one species and six varieties from a triangle of about three miles. Since then they have added four species including *Asplenium ebenoides,* and two other species are known within a few miles. No other small area presents so many forms, but Mrs. N. F. Flynn's list from an area within a ten-mile radius of Burlington presents forty-seven species including *Pteris aquilina pseudocaudata,* new to New England. To these might be added five more, from the Green Mountains, about fifteen miles away.

Mrs. E. H. Terry and Allan Bourn report forty-two species and thirteen forms from Dorset. Mrs. E. B. Davenport, of Brattleboro, forty-one species and six forms, including *Nephrodium simulatum.* Mrs. Davenport also has a list of twenty-four species and six forms from the town of Jamaica, altitude twelve to twenty-five hundred feet. Prof. H. G. Jesup lists in his Hanover Flora forty-one species, and to this number must be added *Woodsia glabella* and *Woodsia alpina,* since found in Quechee Gulf. Miss I. M. Paddock reports thirty-eight species from St. Johnsbury.

Of all the localities in Vermont the Willoughby region is the most surprising. Dr. G. G. Kennedy's Flora includes forty-two species. Here is the most astonishing mingling of northern and southern ferns: *Pellæa atropurpurea* and *Asplenium Ruta-muraria* alongside of *Woodsia glabella* and *Woodsia alpina. Asplenium viride,* so common at Smuggler's Notch, has at last been found here, and I shall be surprised if someone does not find *Nephrodium fragrans.* After the finding of *Botrychium Lunaria,* last summer, one can expect any northern fern, why not *Nephrodium Filix-mas, Cystopteris. montana* and *Polystichum lonchitis. Lygodium palmatum* has been found within a few miles of Brattleboro, and may yet be found in Southern Vermont; but *Isoetes* is the group that furnishes the best chance for new species. Careful search about the Champlain region and the Connecticut River should give us several more species.

OPHIOGLOSSACEÆ.

Botrychium lanceolatum Angstrœm. Most hollows in cool, open woods. Very rare in the lowlands of southern and western Vermont.

Botrychium matricariæfolium A. Br. Rich, moist woods; occasional.

Botrychium Lunaria Sw. One specimen at Willoughby, G. H. Tilton. The only New England station, and probably the only known station south of the Bay of Chaleur, New Brunswick.

Botrychium simplex Hitchcock. Hilly pastures and open woods; occasional.

Botrychium tenebrosum A. A. Eaton. Charlotte, Newfane. Probably as common as *simplex,* but not well known.

Botrychium obliquum Muhl. Moist, gravelly slopes along the base of the hills and mountains; frequent.

Botrychium obliquum dissectum Clute. Cool, loamy soil of fields; occasional.

Botrychium obliquum intermedium Underw. Old pastures and copses; occasional.

Botrychium matricariæ Spring. Old fields; rare.

Botrychium Virginianum Swartz. Rich woods; common.

Ophioglossum vulgatum L. Muck; occasional.

OSMUNDACEÆ.

Osmunda cinnamomea L. Wet woods and pastures; common.

Osmunda Claytoniana L. Wet woods and pastures; common.

Osmunda regalis L. Wet woods and swamps; common.

POLYPODIACEÆ.

Adiantum pedatum L. Rich moist woods; common.

Polystichum acrostichoides Schott. Rocky woods; common and variable.

Polystichum Braunii Fée. Smuggler's Notch, Pursh, 1807, is the type station. Moist woods above 2000 feet altitude; occasionally in "gulfs" at lower altitudes.

Nephrodium Boottii Davenp. Wet thickets and about ponds; occasional.

Nephrodium cristatum Michx. Moist thickets and swamps; frequent.

Nephrodium cristatum Clintonianum Gilbert. Swampy woods; frequent.

Nephrodium fragrans Rich. Dry shelves, subalpine cliffs. Mt. Mansfield, Camel's Hump, and Bolton Notch (altitude 300 feet), Mt. Zion (Hubbardton), Taconic Mountains.

Nephrodium Goldieanum Hook. Rich, moist woods; occasional.

Nephrodium marginale Michx. Rocky woods; common.

Nephrodium Noveboracense Desv. Damp woods and swamps; common.

Nephrodium spinulosum Desv. Moist woods; occasional.

Nephrodium spinulosum dilatatum Baker. Mountain woods; common above 2500 feet altitude.

Nephrodium spinulosum f. intermedium Davenp. Woodlands; common.

Nephrodium simulatum Dav. Brattleboro, *Mrs. F. B. Horton.*

Nephrodium Thelypteris Desv. Swamps and wet places; common.

Nephrodium Pittsfordense Slosson. Cold bogs: Pittsford, Shrewsbury, Dorset, St. Johnsbury.

Asplenium angustifolium Michx. Rich, moist woods; occasional.

Asplenium ebeneum Ait. Rocky woods; frequent.

Asplenium ebenoides R. R. Scott. Limestone; Rutland, *G. H. Ross;* Proctor, *G. A. Woolson.*

Asplenium Ruta-muraria L. Limestone cliffs of western Vermont; occasional. Willoughby Mt., *E. Faxon, F. A. Winslow.*

Asplenium Trichomanes L. Shaded cliffs; frequent.

Asplenium viride Hudson. Cliffs, Mt. Mansfield and Camel's Hump, Willoughby Mt.

Athyrium thelypteroides Desv. Rich woods; frequent.

Athyrium Filix-fœmina Roth. Moist woods; common and very variable.

Camptosorus rhizophyllus Link. Shaded rocks, especially limestone; locally common in western Vermont. Rare in towns of the Connecticut river valley north to Norwich.

Cystopteris bulbifera Bernh. Moist, shaded ravines; frequent.

Cystopteris fragilis Bernh. Rocky woods and ravines; common.

Dicksonia pilosiuscula Willd. Hilly pastures; common.

Onoclea sensibilis L. Moist meadows and thickets; common.

Struthiopteris germanica Willd. Rich alluvial soil; common.

Pellæa atropurpurea Link. Limestone cliffs; occasional in western Vermont. Willoughby Mt.

Pellæa gracilis Hook. Moist limestone rocks; occasional.

Phegopteris Dryopteris Fee. Rocky woods; common.

Phegopteris hexagonoptera Fee. Rich woods; occasional.

Phegopteris polypodioides Fee. Damp woods; common.

Pteris aquilina L. Pastures and woodlands; common.

Pteris aquilina pseudocaudata Clute. Sandy plains; Burlington, *F. A. Ross.* Only station in New England.

Woodsia glabella R. Br. Moist, mossy, shaded, subalpine cliffs. Willoughby Mt.; Mt. Mansfield; Bakersfield Ledge; Quechee Gulf (altitude 600 feet).

Woodsia alpina S. F. Gray. Moist, mossy, exposed, sub-alpine cliffs. Mt. Mansfield, Willoughby Mt.; Quechee Gulf (altitude 600 feet).

Woodsia Ilvensis R. Br. Rocks; common.

Woodsia obtusa Torr. Rocky banks and ledges; occasional.

Woodwardia Virginica Sm. Fort Ethan Allen pond; Franklin bog.

EQUISETACEÆ.

Equisetum arvense L. Moist, gravelly or sandy banks; common.

Equisetum hiemale L. Moist gravelly banks; common.

Equisetum fluviatile L. Shallow water, with muddy bottom; common.

Equisetum littorale Kuhlw. Gravelly shores of Lake Champlain; rare.

Equisetum palustre L. Wet sandy shore, Lake Champlain, Burlington; Evart's Pond, Windsor, *W. H. Blanchard;* Willoughby Lake, *E. Faxon.*

Equisetum scirpoides Michx. Moist, cool woods; occasional.

Equisetum sylvaticum L. Moist shady places; common.

Equisetum pratense Ehrh. Willoughby Lake, *Dr. G. G. Kennedy.*

Equisetum variegatum Schleich. Gravelly shores; occasional.

Equisetum variegatum Jesupi A. A. Eaton. Royalton, bank of White River (type station); *H. G. Jesup* and *H. Q. Ward.* Gravelly shores; occasional.

LYCOPODIACEÆ.

Lycopodium annotinum L. Cold woods; common.

Lycopodium annotinum pungens Spring. Summit of Mt. Mansfield.

Lycopodium clavatum L. Dry woods; common.

Lycopodium clavatum monostachyon Hook. Dry woods; occasional.

Lycopodium complanatum L. Woods and thickets; common.

Lycopodium tristachyum. Occasional; dry woods.

Lycopodium inundatum L. Moist soil; occasional.

Lycopodium inundatum Bigelovii Tuck. Sunderland, *Grout.*

Lycopodium lucidulum Mx. Cold damp woods; common.

Lycopodium obscurum L. Moist woods; common.

Lycopodium sabinæfolium Willd. Cold mountain woods, Rochester.

Lycopodium Selago L. Mt. Mansfield and Camel's Hump. Johnson (altitude about 800 feet).

ISOETACEÆ.

Isoetes echinospora Braunii Engelm. Margins of ponds and streams; common.

Isoetes echinospora robusta Engelm. Miry borders of bogs, northern Lake Champlain; occasional.

Isoetes Canadensis A. A. Eaton. "Brattleboro," *Frost;* Alburgh and Lake Bomoseen.

Isoetes macrospora Dur. Willoughby, *Dr. Kennedy.*

Isoetes Tuckermani borealis A. A. Eaton. Grout Pond, Stratton, *Eggleston and Grout.*

SELAGINELLACEÆ.

Selaginella apus Spring. Moist shady places; Brattleboro.

Selaginella rupestris Spring. Dry, exposed rocks; frequent.

The following list of varieties and forms have been reported:

Botrychium ternatum australe.
Polystichum acrostichoides incisum.
Polystichum acrostichoides forma crispum.
Nephrodium spinulosum dumetorum.
Nephrodium cristatum Slossonæ.

Asplenium ebeneum Hortonæ.
Athyrium Filix-fœmina forma multifida.
Athryium Filix-fœmina forma polycladon.
Athyrium Filix-fœmina forma rhæticum.
Athyrium Filix-fœmina forma angustum.
Asplenium Trichomanes incisum.
Dicksonia pilosiuscula forma schizophylla.
Onoclea sensibilis obtusilobata.
Struthiopteris Germanica obtusilobata.
Osmunda Claytoniana dubia.
Equisetum fluviatile polystachyon.
Equisetum littorale gracilis.
Equisetum palustre polystachyum.
Equisetum palustre ramulosum.
Lycopodium complanatum Wibbei.

This shows a beginning of what might be done if one was inclined to magnify small differences and freak forms.

New York Botanical Garden.

WHAT CONSTITUTES A SPECIES IN THE GENUS ISOETES.

By Willard N. Clute.

In selecting the title for this article I had no intention of intimating that anywhere in it will there be found a definition of an *Isoetes* species; on the contrary, having had occasion recently to work carefully through the North American species, I have been impressed with the fact that no one as yet appears to have a very clear idea of what constitute specific differences. What I may have to say on the subject, therefore, will be largely in the nature of comment and query in the hope that it may induce some older student of the genus to give us a more definite statement of the basis for making *Isoetes* species than has yet appeared. The marks by which the species are distinguished are so obscure as to be puzzling to all but the select few, and in consequence the species have been largely taken upon faith. This faith, in some cases, it seems to me, has been somewhat misplaced, and while the subject is fresh in mind I purpose pointing out what appear to be some incorrect conclusions.

The points depended upon for determining species in the genus *Isoetes* are about as follows: lobing of the trunk, number, color and length of the leaves, number of bast-bundles, presence of stomata, width of the velum or indusium, character of the sporangia, size and marking of the spores and habitat. It may be well to take a look at these items, separately.

HABITAT.—For purposes of classification the *Isoetaceæ* are usually divided into the four sections Aquaticæ, Sub-Aquaticæ, Amphibiæ and Terrestres, which contain respectively species of deep water, species of shallow water, species often exposed to the air and species normally exposed to the air. This is at best a most arbitrary division since plants are unable to choose their location and must often be found in habitats that are far from representative. Take the case of *I. echinospora Braunii.* In the glacial lakes of Northern Pennsylvania, this species, so far as I have observed, invariably grows too deep in the water to be exposed even in the driest seasons. Dodge's "Ferns and Fern Allies of New England," however, says that the plants grow on the muddy shores of streams. Now is this plant an aquatic or amphibious species? Baker says aquatic; so does Underwood; Dodge and Eaton say amphibious; I say, "when Doctors disagree, who shall decide?" Again, Underwood's "Our Native Ferns," 6th edition, names five terrestrial species in North America. Of these, not a single species *grows* in dry ground. They are found in regions subjected to alternate drouth and flood. During the rainy seasons they spring up in the temporary pools, and when the moisture vanishes the leaves decay and the plant goes into a state of æstivation. Sometimes, as in the case of *I. Orcutti,* there is not enough rain for two or three years in succession to form even temporary pools. Then the plants do not appear at all! Can such be properly called terrestrial species? If the plants are to be divided as to habitat it would seem that there should be a new distribution. In all probability two divisions, Aquatic and Amphibious will be quite sufficient. In our own plants at least the so-called terrestrial species would better be called winter and spring species. In the case of *I. Melanopoda*, one of the "terrestrial" species, Engelmann has shown that if kept covered with water it lasts through the summer like other species, but if not its leaves die early in the season. Much more extended observations of the various species both in winter and summer are greatly needed.

THE TRUNK.—Baker in his "Fern Allies" uses the number of lobes in the trunk as a convenient means of separating the species in the various sections, but this is scarcely a satisfactory character. *Isoetes* is like the Dicotyledons in producing a central cylinder surrounded by a ring of growing cells the innermost of which annually add to it on one side while the others produce bark. At certain points these cells happen to be more active and thus a bulge or lobe of the trunk is produced. This lobing is fairly constant for each species, some having two lobes and others three. Some species, however, are indifferently two-lobed or three-lobed and plants with more than three lobes are known. Since less than half a dozen of our species are regularly three-lobed, the lobing of the trunk is not of much assistance in their identification.

STOMATA.—Stomata are the breathing pores of plants; that is, they are openings through which certain gases pass to and from the interior of the leaves. In water plants the submerged leaves bear no stomata and the floating leaves show very plainly the relations of these openings by bearing them only on the upper surface where they are exposed to the air. It is reasonable to assume then, that one of two things is true of *Isoetes:* either the normally submerged species bearing stomata are the descendants of older species that lived exposed to the air for a part of the time, at least; or they are species that are likely to be exposed to the air and therefore equipped for the part. It is a significant fact that in those species producing but few stomata, they are located on the tips of the leaves in the very position to be of most service should any part of the plant be exposed. Stomata, then, it would seem, are not of great diagnostic value, but their comparative abundance should be a fairly accurate index to the depth of water usually inhabited by the plant.

LEAF CHARACTERS.—All plants, except segregates by radical botanists, are bound to vary in size with the kind of soil they inhabit, and up to a certain point the number and length of the leaves may be taken to indicate the comparative vigor of the specimens. We may distinguish, however, between the size that is characteristic of a species and the size that is due to the vigor of individuals. In other plants mere size seldom enters into consideration as a specific character, but among plants so closely alike as the *Isoetes* it may well be taken into account. As to the color of the leaves, the difference in the shades of green is probably of little significance, but the occurrence of red in some species may be of more importance. It is well known that the sea-weeds inhabiting the deeper waters are not green but are various shades of red and purple. This color acts like the leaf-green in the economy of other plants. Possibly it may be of similar service to *Isoetes*. It is noticeable that it occurs most frequently in the species inhabiting deep waters where the ordinary chlorophyll is less able to act.

INDUSIUM.—The sporangia are borne singly in a hollow on the inner side of the leaves at base and the tissue of the leaf grows over the sporangium in such a way as to partly or wholly conceal it. This outgrowth is called the velum or indusium. It is much more variable than the indusia of ferns, and seems of little value in exact work. In certain species, however, the sporangia appear to be always covered by the indusium which may thus be of minor importance in distinguishing species.

SPORANGIA.—In many species certain cells of the sporangia walls become thickened, giving them a spotted appearance. This is seldom regarded as of specific importance. It appears to be fairly characteristic of the whole group the difference between species being a matter of greater or less spotting.

Bast-Bundles.—In these plants, as in all others, the bast-bundles aid in holding the parts erect. In all species some bast is present, but it is best developed and the bundles are most numerous, as would be expected, in the species whose leaves are often exposed to the air. The leaves of the submerged species, buoyed up by the water, have very little bast. Since the amount of the bast depends upon the exposure of the plant, it is perhaps possible to make too much of this feature as a specific character.

The Spores.—In " Fernwort Papers " Mr. A. A. Eaton observes: " I know of no character more unreliable than the sculpture of the spores." With this I cannot agree. Not only does the spore sculpture seem to me to be fairly stable in each species, but this single feature is very characteristic of whole groups. A curious connection between temperature and spore markings also seems to exist among North American species at least. In New England, there is not a single species in which the spores are marked by roundish warts or dots. They are all characterized by spines, ridges or anastomosing crests. As we go southward, however, we find *I. melanospora* with faint warts that suggest the remains of spines and ridges, while westward, the species are, without exception, marked by dots or warts, until Washington and British Columbia is reached, when we again find species with spinulose spores as in New England. That these markings are influenced merely by temperature is doubtless untrue, but so far as I know, no better reason for these differences in markings has been suggested.

That the markings of the spores are inclined to present intergrading forms between what we now regard as species, may be a true gradation, or it may possibly happen that our conceptions of the species are incorrect. It is possible to imagine a certain species growing throughout a State and exposed to conditions that in time would produce some differences in the length of the leaves, the number of stomata, etc. Under such circumstances it is fair to assume, from the analogy of other fernworts, that the spores would be among the last to change their characters. If the extremes of the vegetative parts, however, were selected as characters for the erection of new species, it is easy to see that the spore markings would not present differences that would be specific. This view of the matter seems borne out by the case of *I. riparia* and *I. saccharata,* which, though much alike, have until recently been considered distinct species. Now, however, there are many who look upon them as but two strongly marked races of the same species. Even those who deny that spore-characters are of great value in separating species, freely admit that this single feature is the best indication of family relationship that we have. Let a species be found with spinulose spores, and it is sure to be referred to the *I. echinospora* group, while one with crested spores will be referred to either *I. Engelmanni* or *I. Tuckermani.* In my own opinion the time will come when several of the western species will no longer be regarded as such, but more properly placed as varieties of others. Mr. Dodge has shown that the spore-walls are composed of silex. In the other fern allies (*Equisetaceæ*) in which depositions of silex are found, the arrangement of the deposits has been often considered sufficient for separating species, notably in the case of *Equisetum robustum* and *E. hiemale.* The question then arises, why is it not proper to rely upon this character in *Isoetes?*

As to the size of the spores, much of what has been said of leaf characters applies here. If the plant is vigorous it is to be expected that its spores will be somewhat different in size from those of less robust specimens. There are limits, however, beyond which the spores do not properly vary, and a plant that constantly produced much larger or smaller spores than others with similar markings might with propriety be separated as a variety or species. So far from considering spore-markings as unreliable characters, it seems to me they are the most reliable of any we have.

EFFECTS OF THE SOIL.—It is coming to be recognized that apart from the constituents of the soil which make a plant robust or the reverse, there are other elements that have much to do with its external appearance. Mr. E. J. Hill has called attention in this journal to the fact that the so-called *Asplenium serpentini* cultivated on rocks other than serpentine soon lost its specific characters and became *A. adiantum-nigrum,* while *A. adulterinum* in time turned out to be *A. viride.* Similar instances are to be found in publications on ecological botany. These facts suggest that some of the many species and forms of *Isoetes* in New England may be accounted for upon similar grounds. If the character of the water in a shallow pond is nearly sufficient to determine whether it shall ultimately become a sphagnum bog or a reed swamp, the character of the soil through which flow the streams emptying into such a lake may have some effect upon the *Isoetes* growing there. Americans have thus far shown far greater activity in searching for new species than in reducing hastily assumed species to their proper place as varieties; but the last word in taxonomic botany will not be said until every form is given its rightful place. The student who will carefully cultivate questionable species under different conditions and record exact results will be entitled to our praise quite as much as the species-maker. The question of hybridity raised by Mr. Dodge is also worth investigating.

It is safe to say that no plant is a new species because it looks like one. There are differences that are geographical, or seasonal, or ecological, or personal. In flowering plants some of these have been considered sufficient to characterize species; but it is to be hoped that we may ultimately find some standards by which we may judge of a new form with more exactness than heretofore, and contributions to this end are invited.

Joliet, Ill.

OBSERVATIONS ON LYCOPODIUM SELAGO-LUCIDULUM.

By J. B. Flett.

There has been some discussion in recent volumes of The Fern Bulletin in regard to *Lycopodium selago* and *Lycopodium lucidulum.* In August, 1901, I collected a large form very closely resembling *L. lucidulum.* This grew in dense cedar woods where the moss covered the rich black soil. The altitude was about 2200 feet. The locality was on the southwest side of Mount Tacoma and about six miles from the base of the mountain. My specimens were distributed without specific name under number 1905. Some of the Doctors called it *L. selago* and some *L. lucidulum.* Others were silent. The editor of The Fern Bulletin made it a form of *L. lucidulum.* (See Vol. XI., page 12.) In the same volume, page 46, there is a quotation from *Rhodora* in which L.H. Harvey states that *L. selago* imperceptibly grades into *L. lucidulum.*

During the month of August the writer made a special study of this plant in the region referred to above, where it was first found in 1901. The plant was seen in several stations until an altitude of 4800 feet was reached. Here is grew moistened by the spray of a waterfall, not being over two inches in height. My study coincides with that of Mr. Harvey on Mt. Katahdin. At its extreme altitude the leaves were stiff and formed an acute angle with the stem in strange contrast to the form growing in the dense woods, whose leaves were lax and the whole plant presented a straggling appearance. The writer is not prepared to discuss the validity of the species in question. It would be an interesting topic for someone who has made a close study of the two species. The writer would be glad to read such a discussion in some future issue. His conclusion is that the form known as *L. selago* at a high altitude passes by intermediate forms into the large form of the dense forest.

Tacoma, Wash.

OPHIOGLOSSUM CALIFORNICUM IN CENTRAL CALIFORNIA.

By S. B. Parish.

In a collection of plants sent by Mr. Ernest Braunton from Ione, Amador County, there were some fine specimens of Adder's tongue, which proved to be *Ophioglossum Californicum* Prantl. This species has been known heretofore only from the neighborhood of San Diego, and from a station in adjacent Lower California. Mr. Braunton's interesting discovery now carries it some 500 miles to the north, and from the seacoast inland to the base of the Sierra Nevada. The difference in altitude is less marked, that of San Diego not exceeding 50 feet, while that of Ione is 500 feet.

Mr. Braunton's specimens were collected in December last, and he reports the plants as very plentiful. They were larger than any San Diego specimens I have seen, the largest being four inches tall. This greater development is probably due to the more abundant rainfall at Ione.

It is an interesting coincidence that *Jepsonia Parryi,* a little saxifragaceous plant, which also is peculiar to San Diego, should reappear at Ione. At San Diego this plant is not as narrowly localized as the *Ophioglossum,* since it is found over much of the country, but like it, it occurs at no intermediate point.

San Bernardino, Calif.

THE ROUND-LEAVED MAIDEN HAIR.

Adiantum reniforme.

By Willard N. Clute.

There is probably no genus in the world more distinctly marked than *Adiantum,* to which the maiden-hair ferns belong. The peculiar one-sided pinnules with the main rib running along the lower margins, and the oblong sori concealed under overlapping lobes of the opposite margins are so characteristic that the merest novice has no trouble to refer all ordinary forms to their proper places. More difficulty would be experienced, however, if all the ferns of the world were examined, for then it would be seen that all maiden-hair ferns do not have pinnules of the one-sided type and we should have to fall back on the characters of the sorus and indusium to be sure of our plants. The species that we have chosen for illustration is one of the latter kind. From a casual glance at its fronds we would scarcely take it for a fern at all, much less a maiden-hair fern, but the characteristic form of the fruit dots settles the question beyond doubt. It may be added, however, that maiden-hair ferns with simple entire fronds are exceedingly rare, there being only one other species with this peculiarity in the world. Both are natives of the Old World, *Adiantum reniforme* being found in Madeira and Teneriffe and *A. Parishii* growing in the Malay Peninsula. Our illustration of *A. reniforme* is nearly life size. *A. Parishii* has much shorter stipes.

The genus which *Adiantum* is nearest like is the Tropical one called *Lindsaya.* The latter has one-sided pinnules as in the maiden-hair family and its sori are marginal. The indusium, however, is slightly different, having an inner membraneous indusium and an outer thicker one formed by the reflexed part of the frond. The sporangia, moreover, are situated on the frond at a slight distance from the margin in *Lindsaya,* while in *Adiantum* the sporangia grow from the reflexed lobes that form the indusium. Some tropical forms of maiden-hair have elongated sori that might incline one to think them members of the *Pteris* genus, but in this latter the sporangia are in a continuous marginal sorus and covered by the reflexed edge of the frond.

NOTES ON ISOETES.

By A. A. Eaton.

Some years ago I received from Mr. C. V. Piper two collections of *Isoetes* that were found to be undescribed. Both of these were subsequently duplicated by other collectors, and have been found to hold their characteristics. They may be characterized as follows:

I. PIPERI Sp. nov.

Submerged; bilobed; leaves 8-25, 2-7 cm. long, 2 mm. wide, cylindrical, slightly winged $\frac{1}{3}$ their height, rigid, erect, abruptly pointed, without stomata or bast-bundles; velum broad, $\frac{2}{3}$ or more indusiate; sporangia unspotted; gynospores 570-780*u*, average 700*u*, thickly covered with short distinct warts, the equator nearly obsolete; androsporangia irregularly scattered among the gynosporangia, the spores 36-45*u*, sigmoid crested.

Green Lake, near Seattle, Washington, C. V. Piper, July 11, 1889 and July 12, 1895, no. 2317, type.—De Alton Saunders, 1900.

In appearance this resembles the others of the group, and is distinguished from *paupercula* principally by the broad velum, unspotted sporangia and larger spores covered with distinct, smooth, round tubercles instead of convoluted ridges. I dedicate this species to Mr. Piper, who has extended the author many courtesies in his study of the genus.

I. ECHINOSPORA VAR. FLETTII, VAR NOV.

Leaves 10-20, 2-3 mm. in diameter, 5-8cm cm. long, broadly winged below, abruptly pointed, recurved, with many stomata; velum $\frac{1}{3}$-$\frac{2}{3}$ indusiate; sporangia spotted; gynospores 450-600*u*, average 510*u*, very sparsely beset with short, thick, mostly compressed lamellæ or blunt spines, occasionally cristate and rarely more or less meandriniform-reticulated; androspores 28-36*u*, average 32*u*, spinulose. Differs from any other variety of the species in its very stout leaves, the thick, short, scattered or irregularly reticulate markings on the gynospores and the larger spinulose androspores.

In gravel, Spanaway Lake, 12 miles from Tacoma, Wash. Aug. 1895, C. V. Piper, 2125; Sept. 17, 1899, J. A. Allen; Oct. 7, 1899, no. 949, J. B. Flett, *type,* Lake Mara, Sicamous, B. C., 1899, J. Macoun.

I have held this variety for several years hoping that other collections might more clearly indicate its relationships, but it appears to be constant and very strongly characterized, being fully as far removed from var. *Braunii* as are *Bolanderi* and *maritima.* The gynospore markings are of similar nature to variety *truncata,* but in that they are round, separate, not cristate and very closely set; and androspores in that are also much larger and papillose, while they are spinulose in *Flettii.*

I. ECHINOSPORA VAR MARITIMA (Und.)

Comparative study of type specimens of *I. maritima* Und. has convinced me that it is a variety of *echinospora,* very near var. *Braunii,* the gynospores being identical with some form of that variety, from which it is separated by the larger, reticulated androspores, characters not so strong as might be desired. Formerly placed with the terrestrial species, but the nature of the leaves, fleshy, with large air cavities and no bast-bundles, certainly places it among the amphibious species, and inquiries of Prof. Macoun elicited the fact that it grew where inundated regularly by the tides, thus confirming the anatomical diagnosis.

I have received from Mr. Jas. Galen specimens of what prove to be a new variety of *I. Engelmanni.* It may be known as:

I. ENGELMANNI VAR. FONTANA, VAR. NOV.

Trunk 1-2 cm. in diameter; leaves 30-50, 15-20 cm. long, 2 mm. wide, erect, narrowly winged at base, with many stomata and four cardinal bast-bundles, usually reenforced by two others at the ends of the cross-dissipements, and smaller ones scattered around the periphery.

Sheaths .5 cm. with wings 3 mm. wide; velum narrow; sporangia sparingly spotted with light brown cells; gynospores 480-750*u*, average 550*u*, with coarser, more or less broken alveolations; androspores as in the type species. Differs from the type principally by the accessory bast-bundles in the leaves, the spotted sporangia, the larger gynospores and the character of their sculpture. Near McCall's Ferry, Betheseda, Pa., July, 1898: along Part de Posit R. R., in spring water a few inches deep.—Jas. Galen. Type in Herb. A. A. Eaton, cotypes in National Mus., Herb. Mo., and University of Minnesota Herbaria.

Ames Botanical Laboratory, North Easton, Mass.

HOW AND WHERE FERNS GROW IN SOUTHWEST GEORGIA.

By Mrs. Augustus P. Taylor.

Fern news, however local, is always of interest to the fern student. Notwithstanding this fact I would first explain "the setting of Thomasville," the peculiarity of which renders the Flora within a certain area of more than usual interest and of wonderful diversity compared with that on either hand even within a few miles.

Thomasville, the County Seat of Thomas County, is situated in the extreme southwest part of Georgia about twelve miles from the Georgia and Florida line; and is a favorite resort with leisurely tourists, many of whom have evinced their preference by investing in lands and establishing winter homes. Among these may be noted some of the most beautiful estates in America.

The County lies in an elevated chain of low hills which extend into north middle Florida, in formation and general character similar to what is known as the Piedmont region wherein Tallahassee is located. The two towns have much in common, a distinctive feature being their adaptation to the culture of roses. I have reason to believe that nowhere else in America are they brought to such a state of perfection—save perhaps in California. The principal forest growth is pine, but immediately around Thomasville the surface is rolling or gently undulating instead of level as in most of the Piney Woods region. Trees and herbaceous plants are numerous and varied, though within a mile extensive pine forests and turpentine farms can be reached. A trail of white sand is often the only suggestion of a right-of-way through the brown expanse, though this may suddenly turn into a conventional road hedged in by shrubbery and intersected by just such trickling, murmuring streams as would be found in mountainous regions, rendering the scene just left all the more unreal. Nothing could better illustrate this kaleideiscopic effect of the scenery than the lovely drive encircling the town two miles in every direction, intersected at short intervals by many roads from the "hub" like spokes in a wheel.

In this single drive the difference in topography and geology which furnishes the habitat peculiar to each species is apparent and the botanist, at least, understands the diversity of the flora—a mountain flower and one indigenuous to the southern coast side by side—the meeting of the North and South, as it were. Not so with the Ferns, they are more exacting, their environments must be just to their liking. There are no rocks to shelter and keep them cool, but of those finding conditions suitable to their needs, water for their feet and sun for their heads, there are quantities. A few there are that merely demand shade and a wealth of deep leaf mould wherein to luxuriate. Such is *Phegopteris hexagonoptera,* our broad beech fern, which finds a congenial home in rich woodlands where the *Magnolia grandiflora* towers out of sight and the beech grows to giant proportions, their branches intertwining high up to form a lofty ceiling. A cool open space is the result penetrated by just a glance of the sunrays sufficient for the tender green coloring of this shade loving fern, and the dense carpet of leaves is just the needed foothold for the running roots so slightly anchored. Where they reach the height of perfection—growing in great colonies as large as a room, then, for some inexplicable reason, skipping a place and forming another room—there is but little underbrush and but a scanty growth of a flora rare and peculiar to such spots. Nowhere else do I find *Uvularia perfoliata,* here too is a Cucurbit rarely met with elsewhere, and a pure white *Desmodium* and the carrion flower smilax (*Nemexia herbacea*). *Asclepias variegata* raises its pure white, crimson-hearted pompons, so like wax, out of the very midst of the green beds of *Phegopteris.* Surely we have few flowers more exquisite than this, especially when overtopping the tender green of the broad beech fern. Here too *Aristolochia serpentaria* is everywhere underfoot with its one little pitcher snugly tucked under the leaf mould, often buried in the sand close to the orange yellow roots, and always so strongly aromatic as to be unmistakable. Where the sand is washed to the surface and the leafmould not so deep the partridge berry (*Mitchella repens*) trails in profusion and a dwarf species of purple violet carpets the ground in the Spring with its running prostrate stems. The shade loving *Elephantopus* (*Elephantopus Carolinianus*), shoots up candelabra-like branches from the rosette of broad green leaves. If seen at the hour of the day when its purple lights are expanded, it lends a needed note of color. Where the *Phegopteris* reigns, *Leptamnium Virginianum* and *Tipularia unifolia* are almost sure to be found by the trained eye, though both are often met with where this fern does not grow. So perfectly do they tone with the brown underfoot, that their presence is apt to be overlooked, unless a gleam of red catches the eye as the glint of the sun rests on the crimson-lined leaf of the *Tipularia.*

Another treasure hidden here from the common view —coming to the light only to the most appreciative eye, is a diminutive form of *Botrychium Virginianum.* Fern authorities insist that a larger form should be found near by and think it may be a depauperate specimen, but the theory does not hold good, for the species would hardly be suspected of being depauperate with such possibilities as its habitat suggests. It is a perfect fern on a liliputian plan and *must* reach the proportion for which it was ordained. Species of *Cornus, Celtis, Cercis,* and *Prunus* are among the trees which form the outskirts of these sheltered glades, with the ever present *Callicarpus Americanus.* At the foot of trees and among lower growth, *Aspleneum ebeneum* forms beautiful clumps. The fruiting fronds are so tall and broad in the middle as to be easily mistaken, at a casual glance, for the Christmas or sword fern. The finest are to be seen leaning against the trunk of small trees or shrubs, apparently a forethought that the tall fruiting fronds may be protected from accidents to which they are liable when prostrate. An occasional clump of *Polystichum achrostichoides* is also found in such places, but this is not its preferred habitat. This fern loves the shade, but requires more moisture than the loose sandy soil holds, and is found at its best on the thickly wooded slopes bordering streams where the water trickles in wet seasons and the earth is ever moist. Here it forms magnificent specimens, the tall, leathery fronds of a rich green heightened in effect by contrast with the rich brown of chaff and indusium. Its erect habit makes it one of our most beautiful ferns. Each clump seems more perfect than the last, with every leaf so arranged that it requires some courage to upset one though ever so plentiful.

Follow the Christmas fern to the edge of the stream and there the lady fern (*Athyrium filix-fœmina*) is sure to hold sway, from the most delicate straw colored forms which hug the ground and dip into the edge of the water to those of a darker green with bright transparent red stipe and rachis. The latter stand erect, two feet and more tall, and grow higher up where the soil is not so wet. A beautiful variety is this especially as seen in the sunshine, which brings out the rich translucent coloring.

The *Woodwardias,* too, follow streams, but streams of a different order—Pine Barren streams, where the flora is altogether different from that of the rich wooded streams and where the feet sink deep in *Sphagnum* instead of leaf mould. Here *Woodwardia angustifolia* luxuriates and is perhaps our most abundant species. Its black running roots trail in and out of the *Sphagnum,* under other roots and in every conceivable crevice. Fronds of every size can be found from the smallest to those broader than the hand. I have a few times found specimens with large fronds distinctly twice pinnate. When the black stipe holds erect the fertile frond it is even more conspicuous. *Woodwardia Virginica* has the same range though wandering further from the water, perhaps, and is almost as plentiful. *Osmunda cinnamomea* might more justly be given the palm for quantity, for while not met with so generally, it often takes possession of a broad area. Stretching out as far as the eye can reach it grows tall and rank and is a noticable feature of the landscape whether robed in varying shades of green, in fruit or as fantastic fiddleheads. So level are the pine flats, its favorite habitat, that it can be viewed to better advantage there than elsewhere. The fronds turn to a clear gold late in the season and can be seen at a great distance. The cinnamon fern is called by the Negroes " Ferrin," a corruption, perhaps, of fern. It is universally known and the root valued highly by them for its supposed medical qualities.

The root of *Pteris aquilina* is also used by them, but is not called " ferrin," but " Black Root." Another common name for the bracken which is not recognized as a fern even by those who usually know a fern, is " Poor Man's Soap." This, though probably a localism, is well established and so impressed me as a child as to be held responsible for the untidy appearance of every tramp, for on experimenting I found it a poor substitute. This species is as familiar a feature of the Piney Woods as the wire grass with which it mingles, together flooring the illimitable stretches of pine forests. The variety—*pseudocaudata*—grows in sandy places near rivers or our more rugged Pine Barren streams. The wing-like fronds are immense and quite suggestive of the eagle origin, being finely cut, they are more lacy in appearance than the common Bracken.

Osmunda regalis is far from scarce and is truly a royal fern. Some of the handsomest specimens are found with their roots in deep ditches, rearing their heads however high, until the sunlight is reached, which is as necessary to them as the moisture is for their roots. They are not particular as to their surroundings if these requirements are met. They are as often found in a ditch open to the full rays of the sun as in the underbrush bordering streams. Another of our ditch loving ferns is *Nephrodium patens,* found too in sandy soil and inclined to shaded situations. In general appearance this fern is so distinctive as to be recognized at first glance. Notwithstanding the fronds are softly pubescent and of a tender green they are less perishable when cut than many apparently more durable and is one of our most attractive ferns.

One other *Nephrodium* we have, *N. Floridanum.* Like all of Nature's choicest treasures it is not exposed to the common gaze, but grows in such secluded spots as are only sought by the most appreciative. Though often within a few feet, its presence is not suspected until the tangle of cat-brier and underbrush is penetrated, when a sight never to be forgotten by a fern lover is exposed to view. Within the depths of the green woods this superb fern grows broadcast. As one wades through the tropical luxuriance the tip of the fronds tower more than waist high. Like a veritable greenhouse the enclosure seems and a refreshing picture it is in mid-winter, for the fronds though fallen to the ground retain their gloss and deep green, the most beautiful of all our evergreen ferns. Not until one is in the vicinity of the Lakes and nearing the Florida line is the sensitive fern (*Onoclea sensibilis*) met with. *Adiantum capillus-Veneris* grows in profusion at a deep lime-sink in an adjoining county. I have not despaired of finding it nearer, as there are similar spots unexplored in this county.

One other must be added to our meagre list and that is the dear little *Polypodium incanum*, familiarly known as "Little Polly" with children. Little Negroes delight in bringing it up with their bundles of fagots. Placing it on the lids of the cooking vessels over the open fires, in the end of the cabins where the family cooking is done, they watch its antics with glee. Much that is interesting can be learned from the colored race. Unconsciously they have acquired many of Nature's secrets, not only from the fact of so much of their time being spent in the fields, but because it is habitual with them when not at work or nodding in the sunshine to be wandering in the woods, especially on the Sabbath day. The medicinal qualities of plants has a peculiar fascination for them. The resurrection fern is also a common name for this fern. It may be of interest to some—especially those who believe in its preference for the live oak—to know of the various trees on which I have seen it growing. Observation leads me to think that wherever it finds a spot so situated as to retain a little soil, furnishing the necessary foothold with plenty of moisture, there this hardy little fern will thrive. A decaying roof sheltered by o'er-hanging branches is one of its favorite locations. Here it grows on the oak, beech, maple, *Magnolia grandiflora and M. glauca, Oxydendrum, Osmanthus, Liriodendron, Symplocos, Cliftonia, Melia,* and red cedar. I have never seen it on the cypress or pine. Our fern escapes are worthy of mention, especially *Lygodium Japonicum,* as this is the only station known in America. It promises to be a valuable one, having already become firmly established withstanding some of our most severe winters. It escaped from a greenhouse (several miles from the town) and now lines the sides of a ditch which runs into a swampy locality. It is a noticable feature of the roadside as it climbs the dogfennel and other weeds far from associations with greenhouse products. Another, *Pteris serrulata,* has become so established as to be almost termed naturalized. Not only has it spread on the banks of a stream which runs through a portion of the town, but peeps from many a sidewalk bridge, in ditches, and in the crevices between bricks especially when forming the foundation of fences. This too, is one of the ferns almost sure to be found in the open well, where it is also no uncommon thing to find *Adiantum hispidum.* Occasionally *Woodwardia angustifolia* is found with them. While wells are almost invariably near habitations it is improbable that either fern was ever cultivated nearer than several miles.

Thomasville, Ga.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

DAVENPORT, G. E. *A New Type of Aneimia.* Illust. Fern Bulletin, Ja., 1905.

HARPER, R. M. *The Fern Flora of Georgia.* Fern Bulletin, Ja., 1905.

HILL, E. J. *Equisetum scirpoides in Illinois.* Fern Bulletin, Ja., 1905.

PARLIN, J. C. *Asplenium Trichomanes in Maine.* Rhodora, Ja., 1905.

ROBINSON, B. L. *A Connecticut Station for Lycopodium Selago.* Rhodora, Ja., 1905.

SCHAFFNER, J. H. *Lycopodium Porophilum in Ohio.* Ohio Naturalist, Mr., 1905.

SCHAFFNER, J. H. *The Life Cycle of a Heterosporous Pteridophyte.* Illust. Ohio Naturalist, Ja., 1905.

SCOTT, J. G. *History of Asplenium ebenoides.* Illust. Germantown Independent-Gazette, Ja. 13, 1905.

VAN HOOK, M. L. *Illinois Ferns Near Lake Michigan.* Fern Bulletin, Ja., 1905.

WACKER, A. H. *Ecological Notes on Ohio Pteridophytes.* Ohio Naturalist, Mr., 1905.

EDITORIAL.

Two or three complaints have reached us to the effect that some copies of the January number sent out were soiled or damaged in binding. We take the opportunity, therefore, to say that we are interested in having every one of our readers receive a perfect copy of each number issued, and we will gladly replace such copies if notified of the fact. We do not intend to send out imperfect copies, but it is impossible for us to see every one, and we shall appreciate it if subscribers will notify us when damaged copies are mailed.

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That each fern student should endeavor to make his own list of species as large as possible is of course to be expected, but when it comes to a comparison of one locality with another mere numbers may often be very misleading. Unless each student agrees to call certain things species and certain other things varieties, it is easy for a radical to list a lot of forms as species and so appear to have many more species than really should be placed to his credit. This fact is of special importance in comparing the fern flora of one State with that of another. In regions where such variable genera as *Botrychium, Isoetes* and *Selaginella* abound it makes a great difference whether these forms are considered species or varieties. In editing the Fern Floras of the States we have constantly endeavored to be uniform in this matter, but have met with great unwillingness upon the part of some to view the matter in the same light. Nor have our efforts to preserve a uniform nomenclature met with much greater agreement. There are always a few who insist upon writing *Filix* for *Cystopteris, Dryopteris* for *Nephrodium* and *Pteridium* for *Pteris* to the great confusion of all beginners in the study. They do not insist upon *Filix* because of its lucidity, for *Cystopteris* is far better known. Their reason appears to be either a desire to be different from the great mass of students, or else to follow some nonsensical rule for the overturning of long accepted names. One of the principal uses of the Fern Floras is for comparison and if we use the "new" nomenclature in some and the accepted nomenclature in others no comparison is possible without reducing one lot to the terms of the other. For this reason we are obliged to insist that the floras be written with the nomenclature that finds widest acceptance in America and the world in general, and those who are preparing floras for us will kindly take note of our reasons for insisting on certain names being used.

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The annual session of the Connecticut Chautauqua Assembly will be held at Forestville, from July 13th to July 26th, with the usual attractive program. This Assembly, which last year stood second only to the mother Chautauqua in the number of students graduated, is becoming deservedly popular with those who like to spend at least a part of their summer in the open air. Although the sessions are held in the midst of the forest, comfortable houses are provided for all who attend, and good board at moderate prices may be had on the grounds. Lectures and other addresses by good speakers are given daily in the auditorium, there being scarcely an hour in the day when a talk of some kind is not being given. The Nature work at the Assembly this year will be in charge of the editor of THE FERN BULLETIN, and will consist of talks on plant forms, plant processes, and plant habits, supplemented by excursions to nearby points for practical applications of the subjects discussed. The geology of the region is varied, consisting of granite, trap and sandstone rocks, which afford a very diversified flora. No less than twenty-nine species and five varieties of ferns were found in the vicinity. Among the varieties was the form recently named *Polystichum acrostichoides recurvatum.* Those who think of attending these sessions may obtain further information by addressing the President of the Assembly at 411 Windsor Ave., Hartford, Conn.

Thirteen years ago, when the Fern Chapter was organized, the Agassiz Association was a thriving society, and at the time it seemed most desirable that the newly formed club should become one of the Association's Corresponding Chapters. With the passing of time, however, the Agassiz Association has come to hold a much less important place in the scientific world, and the suggestion is not infrequently made that the Fern Chapter should change its title so as to more nearly fit the conditions of the present. It has been proposed especially to drop the Agassiz Association part of the name, since never, even at its beginning, has the chapter been anything but an independent society. Should such a change in name seem proper, it would also be well to change the word "Chapter" to either "Club" or "Society." An objection to the title, Linnaean Fern Society, is that there is already a Linnaean Society, and the two might be confused. Possibly Linnaean Fern Club would be more desirable. The name of American Fern Society has also been suggested. This, if not likely to carry with it the idea of a society of fern growers exclusively, such as the rose, carnation and chrysanthemum societies, might be a very good name. In any event it seems high time a change was made, and we know such a move would have the sanction of many members who have never liked the word chapter. The change can only be made upon application of three members and after reeciving a three-fourths vote of the members. It would be well to have this matter taken up and possibly voted upon at the next annual election.

BOOK NEWS.

A volume on "The Teaching of Biology in the Secondary School,"* the joint work of Professors Lloyd and Bigelow, of the Teachers' College, Columbia University, was recently issued by Longmans, Green & Co. The first part of the book is devoted to botany by Prof. Lloyd, while the zoology is discussed by Prof. Bigelow. Both branches of the subject are very thoroughly discussed, and the book is likely to prove valuable to all who teach the natural sciences. An extensive bibliography of each section is included, forming one of the most important features of the volume.

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*The teaching of Biology in the Secondary School. By F. E. Lloyd and M. A. Bigelow, New York. Longmans, Green & Co., 1904. 12mo. pp. 490

A book of more than ordinary interest to the systematic botanist is Rendle's "The Classification of Flowering Plants,"† which discusses very carefully the relationships of both fossil and living gymnosperms and monocotyledons. A second volume to be issued later will perform the same service for the dicotyledons. The present volume contains nearly two hundred illustrations, making a valuable addition to the text.

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†The classification of Flowering Plants. By A. B. Rendle. Vol. I. Gymnosperms and Monocotyledons, Cambridge. The University Press, 1904. 8vo. 400 pp. $2.50 net.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

During the past few months the Chapter has stood in great need of a Secretary. The member elected to this office declined to serve because of ill-health, and Mr. Osmun, who was appointed to fill the office left vacant by the resignation of Mr. House, found it impossible to continue in the place of the elected officer who declined to serve. Notwithstanding the apparent desire of some members to avoid the office, the duties are really very light and it should be considered an honor rather than a task to serve the Chapter as Secretary. For the rest of the year, Willard N. Clute, the editor of THE FERN BULLETIN will act in this capacity. Most of our members need scarcely be told that Mr. Clute was one of the founders and first President of the Chapter. We trust that all members will coöperate with him in making this a record year in our history.

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A Quarterly Devoted to Ferns

July

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1905

The Fern Bulletin

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WILLARD N. CLUTE, EDITOR

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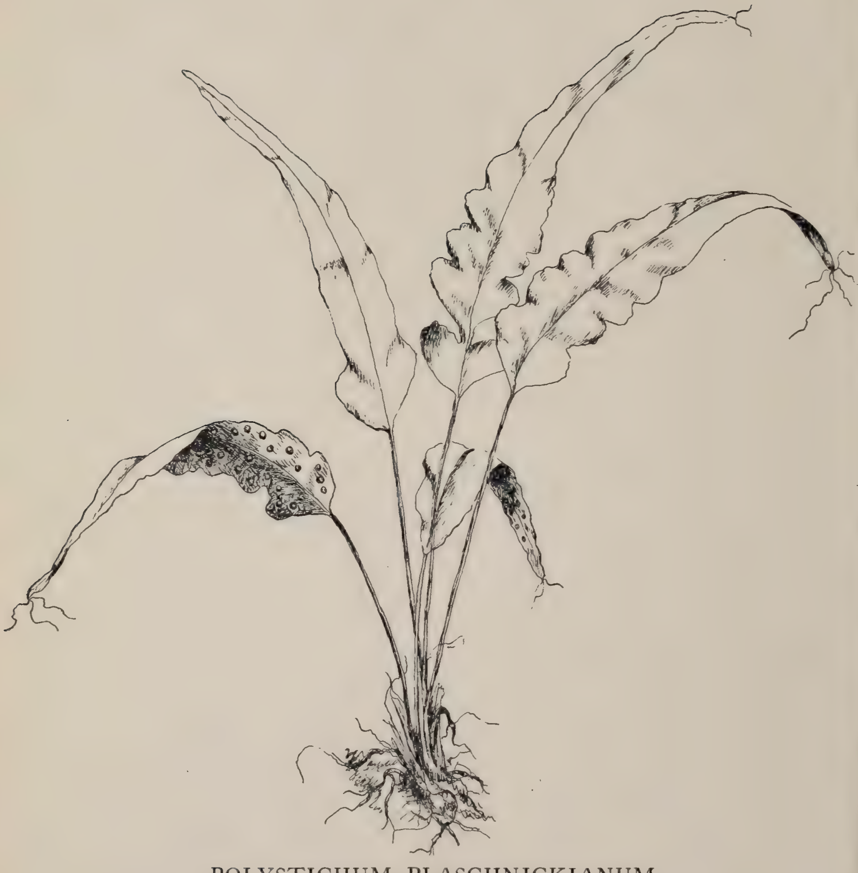

POLYSTICHUM PLASCHNICKIANUM

THE FERN BULLETIN

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SPECIES AND VARIETIES AMONG THE FERNS.*

By Willard N. Clute.

It can scarcely fail to be noticed by one familiar with matters relating to ferns that the describing of new species of ferns from the United States no longer proceeds with the great activity that characterized the industry a few years ago. It has ceased as suddenly as it began. And now that we are far enough from the period to view the list of new species without prejudice, a few observations on species-making in general, and their application to these species in particular, may not be out of place. It is perhaps impossible to lay down absolute rules for distinguishing a species from a variety, but it seems entirely within the bounds of possibility to indicate more clearly than has yet been done what are and what are not specific differences.

First of all, it is interesting to note in this connection some of the ideas held by botanists as to what a species really is. Linnaeus affirmed that "there are as many different species as the Infinite Being created in the beginning," and this is the idea that was generally held for centuries. A modern definition of a species is that it is "The present aspect of a line of organic development destined to become something else in the future, as it was something else in the past." This expression embodies the Darwinian idea that all species are slowly changing. Prof. Underwood attempts a definition in the statement that "We may regard a species as an assemblage of individuals not differing essentially from each other, and

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* A revision of a paper by the same title read at the meeting of Fern Students at St. Louis, Dec. 30, 1903.

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capable of producing like individuals by the ordinary processes of reproduction," and with this Prof. Farlow agrees in his statement that "A species is a perennial succession of like individuals." To some such definition as this most students will subscribe, and it only remains for us to decide what are the "like individuals" of Prof. Farlow's definition, and what constitute the "essential differences" mentioned by Prof. Underwood.

Unfortunately, botanists at present are not disposed to agree on these points, and Prof. Underwood has exactly expressed the state of affairs by the statement that "Sytematists seem inclined to make a species what they choose." True species, however, are matters of fact and not of opinion. It is a fundamental principle of evolution, though seldom admitted by radical botanists, that all species vary to a certain extent; indeed, it is now believed that the object of cross-fertilization in nature is not the securing of stronger offspring, but the production of variation. This being so, it is not to be expected that any species can be marked out by hard and fast lines. It is well known that many botanists are fond of saying that a species is the smallest recognizable segregate, but DeVries' work among the plants has shown that there are many forms that are but temporary in nature, and therefore not entitled to rank as species. We have only to turn to the breeders of plants for illustrations of the ultimate segregate theory. No botanist regards the gardener's hundreds of different cabbages and squashes as separate species, although they are distinguishable from one another and come true from seed. Why then should we give greater consideration to similar forms in nature? If every variation in the cutting of a sterile leaf in the genus *Botrychium* is sufficient to constitute a species, why are not the variations of the lady fern (*Athyrium filix-fœmina*), many of which are extensive enough to affect the shape and size of the whole frond, entitled to the same consideration?

The truth is, there are various degrees of resemblance and therefore various degrees of difference. Some are insignificant; others more essential. When we have properly weighed and catalogued these, we shall, I believe, be on the right road toward a correct understanding of species, sub-species, and forms. None will deny that the characters for distinguishing species should be those which vary the least. A species founded upon characters which are known to be variable has a precarious position at best. Plants are constantly varying, sometimes in very slight degree, more often by appreciable leaps. If the conditions are favorable to the existence of a variant, it will thrive and possibly perfect itself with reference to its surroundings until it becomes a separate species, but it is also conceivable that some untoward circumstances may prevent its development beyond a certain point, in which case it is but logical to call it something less than a species.

The amount of difference between even closely resembling forms can be measured, and it would seem only proper to regard any two forms as belonging to the same species when they do not differ in one or more of their *essential* characters. In this connection it is interesting to note the opinion of Prof. T. D. A. Cockerell. "Species and sub-species," he says, "are units isolated by nature. It is not a matter of taste how many species exist, though one might imagine so, to read the current botanical literature. Ultimately we shall have to know how many forms stand physiologically isolated from one another, and these will be recognized as true species. Sub-species are similar, except that at some point the isolation is as yet incomplete. The word variety may as well be abandoned as a distinct category, but it is useful when we do not know the proper status of a plant. The 'form' (*forma*) is really something different. As I understand it, it expresses a phase existing wholly within specific limits; a result of the variability of the organism, spontaneous or induced by external conditions."

In the days when the Darwinian interpretation of the origin of species prevailed, and every species was supposed to be the summing up of a certain phase of variation through a long period of time, one of the principal distinctions between species was thought to exist in the fact that true species are not connected with others by intergrading forms. DeVries, however, has shown that a plant may give rise to offspring that are quite unlike it and not connected to it by intergrades, and that these may perpetuate themselves by seed. We can scarcely consider these distinct species, however, nor does DeVries so consider them, for he calls them elementary species, to distinguish them from the real or systematic species. The number of these elementary species in certain plants seems almost limitless. In the little whitlow grass (*Draba verna*) they already number more than two hundred, and we suspect that many of the recently described hawthorns, violets, and selaginellas belong to a similar category. It is of prime importance, then, in considering a new form, to decide whether it differs from the nearest related form sufficiently to be a distinct species. It is not sufficient that the two are not connected by intergrades, nor that the two do not look alike. There should be an essential difference. The various forms of the field horsetail do not look alike, but no one has yet had the hardihood to suggest that they are separate species.

On this point Dr. B. L. Robinson's observations are of interest. " It is easy to see," he remarks, " that species as now recorded in literature are by no means alike, and that they cannot be regarded as equivalents in any complete system of classification. Curiously enough, however, the term ' species ' seems to be growing more and more popular as it means less and less. How anxiously most discoverers of new forms are that their plants may prove species, not mere varieties, and finally what a fascination the mere binomial appears to exert upon certain minds! " To elevate mere varieties to specific rank may result in a little temporary glory, but another generation, with no personal feeling in the matter, will certainly reduce them to the position they deserve. Therefore, we may as well correctly name each form in the beginning, and this I believe can be done by studying the plants with respect to their essential differences. Let us, therefore, glance at some of the characters upon which fern species are founded and note their values.

The least varying characters of ferns—what may be called their essential characters—are found in the venation, the rootstock, the fruit-dots, the indusium and the outline of the frond about in the order named. We may now examine these characters separately.

VENATION. This, the most constant feature of ferns because it concerns the very framework of the species, has been rightly selected by Prof. Underwood as of the first importance in distinguishing ferns. He has applied it only to the separation of genera, but it may well be carried further, since if important in distinguishing genera, it should be still more important in distinguishing species. This we find to be true, for by this means alone one can readily distinguish *Nephrodium patens* from *N. molle*, or *N. Thelypteris* from *N. simulata*. While the type of venation in each species is the same, we may expect a few minor variations, even in the same frond, especially in the case of species with anastomosing veins. Two adjoining veins may not always be connected at exactly the same place, nor if free veins are included in the areoeæ, are they always of the same number.

ROOTSTOCK. The rootstock is practically unvarying in each species, and the articulation or lack of articulation between stipe and rootstock are also constant. So well known is the constant character of the rootstock that it has even been suggested that our lady-fern be made a variety of the true *Athyrium filix-fœmina*, because its rootstocks exhibit slight differences. By the rootstock, too, the closely resembling *Nephrodium molle* and *N. patens* may be separated.

FRUIT-DOTS. The *position* of the fruit-dots upon the veins is one of great importance, and from it safe and reliable characters may be drawn. From this it follows that the position of the fruit-dots upon the frond is also constant. The single feature of the position of the fruit-dots is sufficient to distinguish *Nephrodium marginale* from *N. Goldieanum.* Dr. Christ recently united *marginale* and *Goldieanum* as varieties of *Nephrodium filix-mas,* and the great amount of objection that instantly arose proves to be founded upon a sound basis of fact.

SHAPE OF THE FRUIT-DOTS. When taken in connection with the position of the fruit-dots upon the veins, the shape of the fruit-dots offers another constant character. It has always been relied upon in the separation of genera, and doubtless always will be. The size of the fruit-dots is scarcely less constant. There seems to be no species with spore-cases in groups in which there is a material difference in the size of the sori. This is so well known that I have ventured to name a new form of *Cystopteris fragilis,* which depends to a great extent upon the presence of this single character. In species with spore-cases in lines, it is to be expected that the lines will vary somewhat in length, but in no other particular.

THE INDUSIUM. Prof. Underwood calls the indusium the most variable and ephemeral of fern structures, and says it is a mere flattened trichome more subject to variation than any other fern structure. This may be true when the entire fern world is considered, but as regards single species, the indusium is remarkably unvarying. It is interesting to note, however, that the genus *Pteridium* recently revived by Prof. Underwood depends almost entirely on the presence of a second fugacious indusium, to all intents in the nature of one of those "mere flattened trichomes."

OUTLINE OF THE FROND. This, also, within certain limits, is of great importance in distinguishing species. One must not be led too far by it, however. While the general contour varies but little in any species, the cutting of individual pinnæ is exceedingly prone to vary, in this following the rule of terminal parts generally. I shall refer to this again in speaking of certain minor characters.

All the foregoing I am inclined to consider essential characters, and when two forms differed much in regard to any one of them, I should be inclined to regard each as a good species. There are other characters, however, that are so variable as to be of little value in separating species, and yet are of considerable secondary importance. Among these I would name size, color, vestiture, texture, and cutting of the frond. We may now give brief attention to these.

Size. It is scarcely necessary to mention size in this connection. It would be well to note, however, that size, when acompanied by a difference in one or more of the other non-essential characters, may indicate a sub-species. Alone, it can produce only forms. Size, being due principally to soil, moisture, warmth and light, an excess or lack of these readily accounts for over-developed or under-developed specimens. It is to be noted that some of the elementary species of DeVries are chiefly characterized by size.

Color. Color plays a less important part in the identification of ferns than of flowering plants. Nevertheless, it often forms convenient distinguishing features of minor importance. Shades of yellow-green usually indicate shade plants that have been exposed to the sun, while deep greens indicate plants from shady situations, and gray-greens, plants that habitually grow in sun. The decided blue-green hue of the marginal shield fern distinguishes it from all related forms, but it is certain that if color alone was its only distinction, it would not be considered a separate species. In the so-called *Ophioglossum arenarium,* we have an example of a form produced by exposure to sun and drouth. Due to these its size is decreased, and its color is yellowed. Similar conditions have doubtless served to produce the plants named *Lycopodium adpressum* and *L. porophilum.* As regards *Ophioglossum,* Hooker well says: "I confidently affirm that were I to show the authors of many of the so-called species of *Ophioglossum* preserved in the Hookerian Herbarium their own specimens named by themselves, and substitute Britain on the tickets for the distant countries from which they were brought, these authors would unhesitatingly pronounce the plants *O. vulgatum.*"

TEXTURE. In its major features, texture is a fairly constant character, and might have been included among those of diagnostic value. Indeed, in so far as the prime divisions are concerned, the plants are practically unvarying. Coriaceous fronds never vary to papyraceous, and neither of these to herbaceous. It is possible for thin-fronded plants subjected to undue exposure to become thickened, and this must be taken into account. All are familiar with the appearance of shade ferns after exposure to the sun. One of the best instances is found in *Woodsia obtusa,* which in shade is a fairly lax plant, green in color, but in sun becomes erect and yellowish, with thicker fronds.

VESTITURE. The amount of scales, hairs, glands, etc., upon a frond is usually proportionate to the amount of exposure to which it is subjected. In moist regions, ferns are usually smooth; in dry regions, clad with farina, wool, glandular hairs, scales, etc. Intermediate conditions plainly have their effect. The common *Woodsia obtusa* in direct sunlight becomes densely glandular-hairy, and the same thing is characteristic of *Dicksonia pilosiuscula.* Both Prof. Peck and Prof. Eaton have named forms of *Nephrodium Noveboracense* because the pubescence was greater than usual. The principal distinction of the plant named *Nephrodium aquilonare* is a heavier clothing of scales. It can scarcely be specifically distinct from *N. fragrans.*

CUTTING OF THE FROND. Frequently the *outline* and *cutting* of the frond are considered of equal importance. This, to my mind, is a great mistake. The outline of the frond remains practically unchanged, while the serration or lobing varies with the situation in which the plant grows. Even a change in the shelter may alter the serration, as we see in the case of *Polystichum acrostichoides f. incisum.* It cannot be denied that the cutting often makes a great difference in the *appearance* of certain species, notably in *Botrychium ternatum,* but appearance is not everything. The so-called *B. ternatum dissectum* differs from *B. ternatum obliquum* only in a lack of leaf substance between the ultimate veins. I have recently described a form of *Dicksonia pilosiuscula* based upon this very particular. No one would call it a species, and I fail to see how the many recently described species of *Botrychium* can be so considered, when all are based simply on the mere minor cutting of the sterile part of the leaf. It is especially hazardous to describe species based upon such characters in the genus *Botrychium,* which is noted for its great diversity of cutting. Prof. Underwood has rightly written: "Judging from size and external appearances alone, a regular gradation of forms might be arranged from the most diminutive undivided fronds of *B. simplex* to the largest of *B. Virginianum.*" Equally groundless, it seems to me, are the reasons for giving a new name to the Jamaican specimens of *Botrychium Virginianum,* because they have two fronds. Jenman long ago noted the two fronds, but did not consider the two species distinct, although if the Jamaican form habitually produced two fronds and was otherwise like the species, it would be entitled to rank as a subspecies. It turns out, however, as I have shown, that the second "sterile frond" is merely that of the preceding year, which the mild climate allows to live through the winter, and which bears the scar left by the fertile part. Remove the plant to New York, and it would promptly produce but a single frond a year. The difference between these forms, then, is eighteen hundred miles!

It may be seriously doubted whether a plant differing in all of these minor characters from another form, but resembling it in all the characters which I have noted as essential, would be entitled to specific rank. On the other hand, so well known are the essential characters that if one form differed from another in but one of them it would certainly be called a sub-species, and possibly a species. No doubt the matter I have outlined may be modified in some particulars, but I believe, until some such scheme as this is adopted, we will continue to have described new species of very unequal value.

The naming of species, sub-species, and forms so that their values may be seen at a glance, is a matter of no little importance. Species, of course, are to have a generic and specific name, and sub-species should have a third name added. How to distinguish the forms from sub-species is the greatest question. There are forms that are due to the season, the soil, the exposure or the geographical position—the elementary species. These should not be named the same as good sub-species. For instance, *Onoclea sensibilis obtusilobata* is certainly not equal in value to *Nephrodium cristatum Clintonianum.* There are many botanists who object to giving these elementary species any name at all, but the manifest advantages to be derived from the use of such names in indicating exactly what plant is meant, inclines me to think all should have a Latin name. If we precede such terms by the word *forma,* we have probably arrived at a serviceable nomenclature at least.

OBSERVATIONS ON NORTH AMERICAN PTERIDOPHYTES.

By B. D. Gilbert.

Selaginella caribensis Jenm. When Mr. A. A. Eaton was in Florida collecting, in the winter of 1903-4, he sent me, among other things, a little *Selaginella,* which I did not recognize at the time. I expected that when he went back to the Ames Laboratory he would hunt it up and publish it. He did not include it in his "Preliminary List of Pteridophyta Collected in Florida during November and December, 1903," which was published in the Fern Bulletin for April, 1904, and I am not aware that it has been published elsewhere. So it is included herewith, as an addition to the Pteridophytes of this continent. It is a delicate Jamaican species, which has found its way to Florida in company with a large number of others that are not found elsewhere in North America. Mr. Jenman first published it in the *Journal of Botany* (English), in 1886, nearly twenty years ago. It is one of the smallest species of the genus, and belongs in the same group with our *Selaginella apus.* Mr. Jenman noted that the spikes contained only 2-4 sporangia in Jamaica, which is true also of the species as found in Florida.

BOTRYCHIUM SIMPLEX FALLAX MILDE. Although not a common fern, *Botrychium simplex* is pretty well known among fern students. Like most of the *Botrychia,* however, it varies widely, and while Eaton's "Ferns of N. America" describes six varieties, not very much attention has been paid to them. The variety *compositum* found in California is a very striking form, but as nobody except Mr. Davenport, and possibly the Eaton herbarium at Yale, has it, or is likely to get it, it has never created much comment. There is another variety, viz., var. *fallax* Milde, which deserves special notice. In a fine series of the species sent me recently by Prof. E. J. Winslow of Maine, there were three specimens which puzzled me, as I had seen nothing like them before. The sterile leaf is placed high up on the common stipe, and the pinnules of two of them much resemble those of the European *B. Lunaria,* while those of the other are quite like the pinnules of *B. Onondagense* Und. For a time I was puzzled. It should be said right here that the leaves of all three had the distinct petioles characteristic of *B. simplex.* So I resorted to Eaton, and there found that the variety *fallax* is described as having "the sterile lamina above the middle of the plant; otherwise as in var. *incisum.*" That settled the matter, but truly the plant is fallacious, deceptive. Collectors in New England, where this species is more plentiful than elsewhere, should be on the lookout for this particular variety, as it is more scarce than the ordinary ferns.

POLYPODIUM VULGARE CRISTATUM versus P. V. BIFIDO-MULTIFIDUM. The fern which has been known in this country as *Polypodium vulgare cristatum* (Lowe) seems to belong to a different variety in England. Some time ago Mr. C. T. Druery sent me from England a beautiful suite of the English varieties of *Polypodium vulgare.* Among them were var. *cristatum* and var. *bifido-multifidum,* and upon comparing our so-called *cristatum* with those, it was plainly seen to be *bifido-multifidum,* agreeing with the specimen of that variety in every respect. It is the most marked variety of *P. vulgare* that we have in this country, and ought to be known by its correct name. Great Britain has more known varieties of this species than any other country, but the recognized number in North America is gradually increasing.

ATHYRIUM CYCLOSORUM Rupr. About three years ago I received from Mr. A. J. Hill of New Westminster, B. C., several roots of *Athyrium cyclosorum,* which I planted out in my grounds. The ferns grew well and have increased very much in size. Several of the fronds this season (1905) measure 3 ft. in height, and are heavily fruited. They differ much in appearance from *A. filix-fœmina,* and confirm my opinion of their distinctness as a species. One striking peculiarity is that as they approach maturity the edges of the pinnules become prettily tinged with red, and the under side of the lamina also turns dark colored, a dull dark-red or brown. All the veins also become red. The shape of the frond is very much like that of *Struthiopteris.* It tapers from the middle both ways, and the small lower pinnæ come within four inches of the root. The farther down the stipe the pinnæ are situated, the farther apart they stand. The pinnæ themselves are quite different from those of *Asplenium filix-fœmina.* Not only are they cut differently, but the enlargement of the anterior lower lobe, which is so distinct a feature of *A. f. f.,* is entirely lacking here. The texture also is much stiffer and more parchmenty, almost coriaceous. Its coloring reminds one of some of those handsome *Notholaenas,* especially *N. aurantiaca,* although the color is not so pretty underneath; but it is not due to a powdery coating as in some *Notholaenas* and *Gymnogrammas.* It is inherent in the plant itself, as in the var. *ar-*

gyrea of *Pteris quadriaurita*. I do not feel at all sure that it should not be made a new variety.

BOTRYCHIUM MATRICARIÆFOLIUM R. Br. I have recent-received a specimen of this fern from Europe, where it seems to be rather scarce. It was collected by J. Kaulfuss of Nürnberg, and is labeled by him as "*f. normalis.*" This specimen exactly matches several specimens of *B. matricariæfolium* in my own herbarium, both in size and cutting. The whole frond is 16 cm. high, the sterile leaf 4 cm. long, and 1½ cm. wide. It is cut exactly like our own specimens of the same size, with five pinnæ on each side, which are coarsely and bluntly toothed. Among our native specimens there is a great difference in the cutting of the leaf, but this European specimen shows the same cutting as our most common form. I have never seen Breyn's figure cited by Dr. Underwood under *B. ramosum,* but here is an actual specimen from Europe which is positively the same as our *B. matricariæfolium.* It is labeled by an able botanist as the normal form of that species, and much better evidence than a reference to Breyn's figure which is produced for proof that our plant is not the same as the European. American pteridologists should be chary of using the name *B. neglectum,* which was simply given by Prof. Wood in ignorance that it had already been named abroad.

Clayville, N. Y.

DR. R. J. SMITH of Milpitas, Santa Clara Co., California, recently collected some curious specimens of *Cystopteris fragilis* in which the tips of the fronds and often the tips of the pinnæ are prolonged into slender tails which are deeply notched. The tips are also often forked. The pinnæ that are not malformed show a tendency from the normal in having the veins end in little points much as they do in *Dicksonia pilosiuscula f. schizophylla.*

A WALKING SHIELD FERN.

Polystichum Plaschnickianum.

By Willard N. Clute.

Most collectors are aware that while there is a climbing fern family whose members all get up in the world by laying hold of the stems and branches of more independent neighbors, many species in other families also have the same habit. In fact, in tropical regions the ways ferns have of securing an advantageous position in the world are apparently endless, and one is met at every turn not only by climbing ferns and walking ferns, but trailing ferns, creeping ferns and clambering ferns. The walking ferns can boast no single family to which a majority of the walking species belong, though the genus *Camptosorus* is usually dubbed the walking fern family. In a moist, warm region, such as the tropics frequently afford, a great variety of plants may develop the habit of taking root from any part that may touch the earth, and so we have walking ferns belonging to numerous genera.

One of the most interesting of these, because of its resemblance in form to our own walking fern, is the plant which we here call the walking shield fern (*Polystichum Plaschnickianum*). It is somewhat larger than our walking fern, and far less retiring, being found along the paths in open, mountainous forests, often in great abundance. Like our plant, the fronds are broadest at base and taper to the summit. The fronds are narrowed or rounded at base, but at the apex they are retuse, that is, the tip is blunt with a slight notch in it. In these notches the brown, scaly buds from which the new plants grow, are situated. The plant is most abundant on steep, moist banks, in which situations its fronds droop until the buds at their tips are in the best position for taking root.

This plant was called *Aspidium Plaschnickianum* by Kuntze, but the veins are free exactly as in our common

Christmas fern, and it seems much better to call it *Polystichum Plaschnickianum.* The indusia, of course, are circular and attached to the fronds by their depressed centers. The species is abundant in many mountainous regions of the American tropics, but seldom grows at altitudes of less than five thousand feet.

SOME MEXICAN FERNWORTS.

By B. D. Gilbert.

My son, B. T. Gilbert, spent the winter of 1904-5 in the province of Oaxaca, Mexico, and I charged him before going away to collect for me anything in the shape of ferns or mosses that he might meet with. It is to be stated that he knows nothing about these plants scientifically, hardly enough to know whether a particular plant is a fern or something else. But out of all the fronds and scraps of plants that he brought home there was only one which was not either a pteridophyte or a moss or a lichen, and that one was a *Tillandsia,* which a non-botanist might readily be pardoned for regarding as a true moss.

The pteridophytes he procured were fourteen in number, of which I present below an alphabetical list. Mere lists of plants, coming from a far-away country that is seldom visited by a botanist, and giving the approximate localities of their growth, may become highly valuable to the future collector. I have made free use of Martens and Galeotti's "Fougeres de Mexique" in determining the species, but more than half of them do not appear in that work. It is apparent, therefore, that there is excellent opportunity for obtaining new material in that region. If a person who knows nothing of botany can pick up casually such a lot of species as this list contains, what might be accomplished by a good botanist making a thorough study of the region? The elevation renders the climate temperate and bracing in the winter season, and highly favorable for the labor of collecting.

Only three of these fourteen species are found in the United States, but one or two of the others are liable to be found in Florida.

To avoid repetition, it may be said beforehand that these species were all obtained in the vicinity of Tlacolula, province of Oaxaca, Mexico, and near Orizaba, province of Vera Cruz, growing in the shadow of rocks among the Sierras. Both localities lie at about the same elevation, viz., 5,000 feet. They all show the effects of a long drought by having their pinnæ curled up or pendent.

LIST OF SPECIES.

1. *Adiantum Capillus-Veneris* L. The form of this fern that is found in Oaxaca, has larger pinnules than are usually found in the species, very similar to the large form gathered by Prof. Lemmon in the Huachuca Mountains, Arizona. And although collected at the same time with the rest of these specimens, which all seem dry, rusty and weather-worn, the fronds of *A. Cap.-Veneris* are fresh and green, and have a few new sori growing on them. This fern grew on a hillside where the soil was continually moistened by the water flowing from a spring.

2. *Adiantum concinnum* H. B. K. Although there are no full fronds of this species, there is a number of partial fronds, enough to show its characteristic features. It is very regularly pinnated, and the lowest pinnules overlap the rachis. M. & G. have an interesting note on this species, although, strange to say, they do not even mention *A. Capillus-Veneris.*

3. *Asplenium parvulum* M. & G. I retain this name instead of *resiliens* Kunze for the present, because even if the name was previously given to another species by Hooker, it proved at length to be untenable, so I fail to see why it should not hold for the species named by M. & G. I have in a previous FERN BULLETIN expressed an opinion that *A. parvulum* of M. & G. was a different species from any that we have in this country, and this spec-

imen from Oaxaca confirms me in that opinion. It is so small and slender that the name has a definite meaning. My specimen almost exactly matches the figure given in M. & G., and that certainly does not agree with the ferns we are accustomed to call *A. parvulum.* M. & G.'s description hardly tallies with their plates of the fern. In their description they say that the "leaflets are oblong, obtuse, entire, while the enlarged pinnæ of the plate show the edges to be *bluntly crenate,* which exactly agrees with my little specimen.

4. *Blechnum occidentale L.* var. *minor* Hook. This only differs from the ordinary form of the species in being smaller and more delicate.

5. *Cheilanthes Matthewsii* Kunze. So far as I am aware, this species has not previously been reported north of Bolivia. It is a fern, however, on which one could hardly go astray. The large, dense, shiny black scales of the rootstock, the exceedingly stiff and straight rachises, and the much in-rolled pinnules, plainly distinguish it wherever found. Martens and Galeotti were evidently not aware of its existence in Mexico. It has only been reported from Peru and Bolivia, Peru being the country where it was originally discovered. In Hooker's "Species Filicum" it is said to grow in "crevices of rocks and dry places," which agrees with its place of growth in Oaxaca.

6. *Gymnogramma tartarea* Desv. Just the common form of the species, rather small.

7. *Llavea cordifolia* Lagasca. Although these specimens are only fragmentary, they are the gems of the collection. Mr. G. was uncertain whether the plant was a fern or not, so he only gathered the upper fertile part. The fern resembles *Osmunda regalis* in a general way, the lower part of the frond being frondose and sterile, but terminating in a wholly fertile portion at the summit. He picked off merely a half foot or so of the top of the plant and stuck it into an old magazine he happened to have with him, but I was delighted to get even that much of such a species. It is not known to grow in any

other country beside Mexico, and Karwinski and Galeotti obtained their specimens in the province of Oaxaca, very likely near where my specimens came from. M. & G. listed it under Kunze's name, as *Allosorus Karwinskii,* which was not bestowed upon it until 1839. But Lagasca had recognized it as a distinct genus in 1816, and when Hooker compiled his " Species Filicum " he restored it to its rightful author. John Smith, and M. Fée meanwhile had each given it a separate generic name, and Smith indicated its resemblance to *Osmunda* by naming it *Ceratodactylis osmundioides.*

8. *Notholæna Peruviana* Desv. *Notholæna squamosa* (Gill) Baker. Inasmuch as Mr. G. brought only two partial fronds of this species, not very much can be said about it, as I did not have it before. I have, however, a fine plant of *N. brachypus* (Kze.) J. Sm. gathered in Mexico by C. C. Pringle, and that is placed by Baker under his *squamosa* as a synonym, while J. Smith turns them about and makes *squamosa* a synonym for *brachypus.* Hooker's " Species " makes it a *Cheilanthes,* so there is plenty of diversity in the case. M. & G. do not seem to know it. If I am right about this, and the specimens, although apparently young and much enrolled as yet, agree well with the description of *squamosa,* it is quite a different thing from *brachypus,* having a longer stipes and smaller, beautifully fringed scales.

9. *Pellaea cordata* J. Smith. A single small frond represents this species. Hooker in the " Species Filicum " separates *P. flexuosa* Link, from *cordata,* but Baker in the " Synopsis " combines the two, making *flexuosa* a sub-species. In my frond the main rachis is nearly as flexuose as in *flexuosa* itself, but the costæ are not at all so. Besides, the pinnules are much smaller, much more rolled together, and all point downward. All the rachises are peach-colored, and the secondary ones are glanduloso-pubescent.

10. *Phlebodium aureum* (L.) R. Br. This is the same small form that we have in Florida, with sori only 1-serial.

11. *Polypodium incanum* Sw. *forma.* There seems to be no doubt about this being *P. incanum,* and yet it differs in several particulars from our common fern in the Southern States. (1) it is larger; (2) the vestiture is thicker and the texture tougher and more coriaceous; (3) the pinnæ, instead of being round at end and nearly the same width throughout, are much the widest at base and taper to the end, thus making them very long triangular, with a blunt, acute point; (4) the pinnæ also show a tendency to become pinnatifid, one pinna having a pinnule ½ cm. long, about in its middle.

12. *Polypodium thysanolepis* A. Br. This agrees in size with Lemmon's Arizona specimens. It is one of the four squamose species which J. Smith transferred to his genus *Lepicystis,* and which together form an exceedingly natural group.

13. *Selaginella Oaxacana* Spring. A beautiful plant which seems to grow in Mexico in great profusion. It is allied to *S. flabellata,* which is also a native of that country, but our plant has narrower branches and leaflets, and when held in the hand feels as soft as silk. M. & G. knew this only as a *Lycopodium,* and under another closely allied species they say: "This Lycopod covers large areas in the volcanic soil of woods in the environs of Xalapa, to the almost complete exclusion of every other herbaceous plant. It is to be noted that in these humid woods where the rays of the sun rarely penetrate, the terrestrial Lycopods and many species of ferns, protected from the sun, grow with such abundance that they do not permit other plants to become fixed there."

14. *Selaginella pilifera* A. Br. This species is represented by two small plants, very much bunched together, and without spikes of fruit. They are undoubtedly young plants not yet sufficiently developed to bear fruit.

There is still another species of fern which has not as yet been determined. So it is held in abeyance until time and opportunity have been realized for further investigation and comparison.

Clayville, N. Y.

MORE ABOUT THE FERNS OF DORSET.

MRS. EMILY HITCHCOCK TERRY.

Several years ago, I wrote an article for THE FERN BULLETIN concerning the ferns I had found during one summer in Dorset, Vermont. I thought I had quite a remarkable list of them; but one is never at the end, so far as ferns are concerned, in a place so favorable for their growth as Dorset.

I then thought I had exhausted the subject, but last August I found I was to be treated to some surprises, and I hope, during the coming summer, to do still better. Dorset is in a green valley, with mountains and high hills surrounding it. There are streams, bogs, old pastures, and deep, cold woods, where ferns delight to grow.

On one point I was disappointed. The limestone ledges do not yield the rare forms found in similar situations in the northern part of the State. I must make one exception to that statement, however, as I found plenty of *Asplenium ruta—muraria* on the ledges of Mt. Eolus, about half way to the summit. *Pellæ gracilis* is found in several places where the rocks are wet, but *Pellæ atropurpurea* I searched for in vain.

I was fortunate in finding the hybrid *Nephrodium cristatum x marginale;* also *N. cristatum* var. *clintonianum* forma *Slossonæ,* and rarest of all, *Dicksonia pilosiuscula,* forma *schizophylla,* which had only been reported from one locality in Connecticut.

My indefatigable companion in my hunting excursions, was Mr. Allan Bourn, a recent member of the Chapter. It was his first experience in real fern hunting, and his enthusiasm was only second to my own. As his summer home is in Dorset, he will be there early in the spring, with enthusiasm which has been bottled up during the winter, which I trust will lead to his finding some early species, which I am never in season to get. These, with our combined efforts in the later summer, I hope to report next year.

I will append a list of the ferns which I am now able to add to my former list, bringing the whole number up to fifty-three species and varieties.

Athyrium filix-fœmina f. rhæticum, A. f. f. angustifolium, Botrychium ternatum intermedium, Dicksonia pilosiuscula f. schizophylla, Nephrodium spinulosum, N. s. f. dumetorum, N. Boottii, N. cristatum x Marginale, N. cristatum f. Slossonæ, Onoclea sensibilis f. obtusilobata, Struthopteris germanica f. obtusilobata, Polystichum acrostichoides f. incisum, P. A. f. crispum, Woodsia obtusa.

Northampton, Mass.

THE SCOURING RUSH ALONG THE MISSISSIPPI

Through the courtesy of Mr. A. A. Eaton we are able to print below an interesting extract from Flint's Geography, published in 1853. Under "The History and Geography of the Mississippi Valley," the author says:

"The rush, *Equisetum hyemale,* grows on bottoms, in grounds of an intermediate elevation between those of the cane-brake and the deep overflow. It is found, in humbler growth, quite to the sources of the Mississippi. But it finds its full development between 36° and 33°. We have travelled among this grass ,a perfect mat, as high as the shoulders. Nothing can exceed the brilliance of its verdure, especially when seen in winter, in contrast with the universal brown. When it grows high and thick, it is difficult to make way through it; and it has a disagreeable kind of rustling, which produces the sensation that is called setting the teeth on edge. In northern regions its tubular stock is apt to fill with compact icicles. It is well known to be the favorite range of horses and cattle, and is devoured by them with more greediness than even cane. When filled with ice, and thus swallowed, it produces a chill in the stomach of cattle, that is apt to prove fatal. To the cattle and horse boats, that descend the Mississippi, it is an invaluable resource. The cattle and horses, pent up and immovable in these floating barns, for many days in succession, are turned loose, and find holiday pasture in this rich range."

NEPHRODIUM BOOTTII OR NEPHRODIUM SPINULOSUM X CRISTATUM

By A. B. Klugh.

The plant generally referred to as *Nephrodium Boottii* has been supposed to be a hybrid between *N. spinulosum* and *N. cristatum,* and has been described as a sub-species of *N. spinulosum* and also of *N. cristatum.*

As it occurs in Ontario, appearances are certainly in favor of its being a hybrid. It never occurs in any abundance, most usually in a single plant; it is decidedly rare; it is exactly intermediate between its possible parents; and as far as my personal observations have gone, it always grows within a few feet of its possible parents.

The object of this note is not to declare that this fern is a hybrid, but to acquire information on the following points: Does this fern occur abundantly anywhere? Does it ever occur where both or either of its possible parents are absent?

Anyone in a position to answer these queries will greatly oblige me by doing so, and also by sending a specimen. The specimen is required because I have had so many supposed *N. boottii* submitted to me which were merely forms of the extremely variable *N. spinulosum.* These forms might be responsible for statements to the effect that *N. boottii* was common in a certain locality, and that it occurred away from either *N. spinulosum* or *N. cristatum.*

I shall be pleased to refund postage on specimens, or to give exchange in Pteridophyta, Graminæ, *Carex* or *Aster.*

Macdonald Institute, Guelph, Ont.

BOTRYCHIUM BITERNATUM UNDERW.

By A. A. Eaton.

Mr. W. C. Dukes of Mobile, Ala., in a small but very interesting collection donated to the Fern Society herbarium, includes specimens of this very rare species, collected, ripe, in March, 1905. These beautiful plants are very characteristic, possessing a very distinct individuality, and convince me of the wisdom of Dr. Underwood in referring them to a distinct species. In the same package Mr. Dukes sends a very odd form of *B. ternatum obliqnum,* the oddest I have yet seen, collected in October, 1904. It will thus be seen that the season of fruiting, as pointed out by Dr. Underwood (*Bot. Gaz.* **22**: 408; *Bull. Torr. Bot. Club* **25**: 529), is different from that of *ternatum,* even in the same habitat. It is to be hoped that Mr. Dukes will be able to secure enough of this very interesting species to supply the principal herbaria with it.

The Ames Botanical Laboratory, N. Easton, Mass.

COMPLETE SETS OF THE FERN BULLETIN.

Three more complete sets of this magazine have come to light, making a total of twenty known sets. It is not likely that five more sets are in existence; though there are several nearly complete sets located. One of these lacks a single number of one volume to be complete, but though we have tried for nearly a year we have been unable to complete it. If any reader has any numbers prior to Volume VI. we shall be glad to offer cash for them. It is something of a distinction to possess a complete file of the magazine, inconsequential as the first few volumes were. Those to be added to the list at present are: Miss Harriet Wheeler, Chatham, N. Y.; Dr. C. B. Graves, New London, Conn., and Prof. W. G. Farlow, Cambridge, Mass. If any others have complete sets we would be glad to hear from them.

NOTES.

The Ames Botanical Laboratory, North Easton, Mass., have duplicates of some of the rare ferns recently collected in Southern Florida by Mr. A. A. Eaton. These are offered in exchange for orchids. Those who can supply orchids should write to the Laboratory, stating offers.

An interesting post-card was recently received from Mr. H. E. Ransier, Manlius, N. Y. The back had been treated with the substance used in making blue-prints, and upon this was printed an excellent likeness of *Botrychium lunaria.* This would seem to be an excellent way of treating small ferns, anl might form the basis for a pleasant exchange between members.

Mr. H. A. Green of Tryon, N. C., notes that the specimen of *Pteris cretica* mentioned by Mr. R. M. Harper on page 9 of this volume as having been collected by Mr. Green near Augusta, Georgia, has since been decided to be *P. serrulata.* Before discovering the mistake, Mr. Green sent the same species out as *P. cretica* to several correspondents. The error should now be corrected.

From the " Proceedings of the Natural Science Association of Staten Island," of March 18th, 1905, we note that Prof. Philip Dowell has found on Staten Island that form of *Nephrodium spinulosum* that has been named *N. Pittsfordense.* It was growing on a stony embankment amidst plants of *N. Marginale* and *N. Spinulosum* —a situation quite like that from which the original plants came.

While botanizing near Southampton, Long Island, in July, the editor found a new station for *Lycopodium alopecuroides.* The plants were found on the margin of the small ponds that so often fill the depressions among the sand dunes. The plant has been reported from Long Island several times, but with few exceptions specimens have always turned out to be the variety *adpressum*—or *chapmani,* if you prefer the new name. The editor was first to report the typical *alopecuroides* from Long Island, having found it at Babylon, seven years ago. Jelliffe's Flora records it from several other places.

It is well known that the fertile parts of fern fronds usually perish soon after the spores are shed. So universal is this habit that there is probably no species of fern in the world in which the fertile frond outlasts the sterile one, unless it be the so-called sensitive fern. It would be interesting to investigate all our ferns with reference to this habit. There is a wide range of dates at which the fertile fronds fall, from those of the cinnamon fern in early spring to those of the sensitive fern, which do not disappear until the following year. The *life* of the sensitive fern's fertile frond, however, is much shorter. It is only because of the woody nature of the stipe that it stands erect through the winter. In the case of the small rock ferns, it has been often intimated that the fertile fronds of maiden-hair spleenwort do not last through the winter, but Mr. W. A. Poyser of Philadelphia sends fertile fronds collected during the first week of April that appear quite as vigorous as any to be found in autumn.

Mr. Amedee F. Hans, on the Palmer Estate, Stamford, Conn., has a large collection of living ferns, and is much of an experimenter. In a letter to Mr. Ferriss concerning his experiments with spores, he writes: " Do you collect abnormal ferns? When you are once in it, it will give you many pleasing surprises. There is a limit in the growing of species, but there is none in the forms. There is a great difference in the seedlings. I find that the prothalium growing from spores taken from the middle part of the frond are generally normal and more vigorous, and interfere with the growing of those taken from the spores from affected or abnormal parts of the frond; therefore the result of the operation will be a lot of normal plants, with only a few abnormal forms, with nearly no new forms. If the spores are taken from the most affected part of the frond, the result will be quite different—few normal and plenty of abnormal plants with some beautiful new forms. I wish you would try it. You will be much interested in the experiment."

As the early numbers of this magazine became scarce, we repeatedly gave notice that the supply was limited, but few appeared to appreciate the necessity for hurry. Later, when Volume V. went out of print, we were often offered a dollar for a single number needed to complete files, and had to decline the offer because the number was unobtainable. Volume VI. is now practically out of print. It will be entirely so in another month. To some the charge of six dollars for a set, including this volume and succeeding ones to the present, seems out of proportion to the value offered, but it should be remembered that many new species were described and illustrated in them, and many additional features add to their interest. They will always be worth the money paid for them, and are likely to increase in value as the years go by. But nine more sets are offered. All cannot have full sets. The first to order will be the fortunate ones. The sets are especially valuable to young students who are not familiar with the literature of the subject.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CARDIFF, I. D. *Development of sporangium in Botrychium.* Illust. Botanical Gazette, My. 1905.

CLUTE, W. N. *The Round-leaved Maiden-hair.* Illust. Fern Bulletin, Ap. 1905.

CLUTE, W. N. *What constitutes a species in the Genus Isœtes.* Fern Bulletin, Ap. 1905.

EATON, A. A. *Notes on Isoetes.* Fern Bulletin, Ap. 1905.

EGGLESTON, W. W. *The Fern Flora of Vermont.* Fern Bulletin, Ap. 1905.

FLETT, J. B. *Observations on Lycopodium Selago-lucidulum.* Fern Bulletin, Ap. 1905.

GILMAN, C. *Two Ferns New to Vermont.* Rhodora, Je. 1905.

MAXON, W. R. *Adenoderris a Valid Genus of Ferns.* Illust. Botanical Gazette, My. 1905.

MAXON, W. R. *A New Asplenium from Mexico.* Illust. Torrey Bulletin, D. 1904.

MAXON, W. R. *A New Botrychium from Jamaica.* Illust. Torrey Bulletin. 1905.

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UNDERWOOD, L. M. *The Early Writers on Ferns and Their Collections.—IV. Pres. John Smith.* Torreya, Mr. 1905.

EDITORIAL.

It is due to Mr. W. W. Eggleston, whose "Fern Flora of Vermont" appeared in the April number of this magazine, to say that his article was pretty severely edited. Mr. Eggleston believes in the so-called "new" nomenclature, and in his list used *Dryopteris, Filix, Matteuccia,* and *Pteridium.* These generic names have no meaning to students interested in comparing the flora of one State with that of another by means of our fern floras, and for that reason they were changed to those used in the other lists. This was strongly against Mr. Eggleston's inclination, although he kindly agreed to the change being made. We trust that others who are preparing articles of this kind for us will note our requirements and the reasons for them.

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The writers of the Fern Floras of a large number of the States have been selected, but work on them is not progressing as rapidly as we could wish, for the present issue finds us without a single flora for publication. It is against our custom to hurry those who are preparing matter for us, but we hope this notice will be sufficient to produce more speed in their preparations. Among the floras upon which work has been begun may be mentioned those of Maine, Massachusetts, Connecticut, Pennsylvania, Ohio, Illinois, Missouri, Idaho, New Mexico, and Mississippi. Eleven floras have already been issued, namely, Vermont, New York, Montana, Washington, Iowa, California, Texas, Louisiana, Georgia, Kentucky, and Florida.

*

For the information of those who have recently joined the Fern Society and those about to join, we wish to say that while this journal is the official organ of the Society, the two are not identical. All members receive the Fern Bulletin free, but the magazines are paid for by the Society. Any of our subscribers who join the Society should notify us to stop their subscription, unless they wish to receive two copies. Similarly, members of the Society who for any reason cancel their membership, will not need to notify us to cease sending the magazine; but they should understand that a notice to stop sending the magazine is not the same as resigning their membership in the Society. Subscribers to the magazine who wish to become members of the Society may have their unexpired subscriptions credited upon their first year's dues.

⁂

Sticklers for exactness in expression would lay down very hard and fast rules for the writing of the scientific names of plants, some of which we are not inclined to follow. For instance, we are assured, and certainly this is the way the world in general looks at the matter, that the plural of *equisetum* is *equiseta,* although the plural of equisetum when not italicized may be equisetums. It seems to us, however, that there may be circumstances that permit the plural of italicised words to be formed by adding the letter s. The theory of forming plurals of scientific words is that a word taken from a foreign language forms its plural as in that language, and this gives sanction to the form *equiseta,* but are the names of plants to be considered strictly in this category? We incline to consider such words as Aspidium, Dryopteris, and Lastrea as mere names, and believe we violate no essential rule when they are written as the names of plants without italicizing. In fact, many scientific publications now print these and similar words in Roman when indicating genera and species, while those which still cling to the italic for the lesser divisions of the plant would write the families in Roman, as for illustration, Polypodiaceæ and Ranunculaceæ. If we are to consider these words as mere names when used in botany, we may certainly write them in Roman, but the special advantage in using them otherwise, and possibly the principal reason for the italic being retained in scientific publications, is the facility with which the species may then be picked out from the printed page. All who have been obliged to consult the literature of a subject will appreciate the difficulty of discovering a reference to any species when not italicized. It seems safe to conclude, from the practice of scientific writers that the words used for genera and species are primarily names. If this is true, there can be no objection to our making plurals after the English method. It is the practice by many at present to either write a plural after the Latin or Greek form and italicize it, or give it the English plural and print it in Roman, but we maintain, for reasons just stated, that it is entirely proper to use such terms as *Woodwardias* and *Polypodiums* in italics. The reasons for our desire to so write them being that the italic plurals are often not familiar to young students, while to write the English plural and not italicize them renders them likely to be overlooked. In any event, we purpose adopting this scheme for this journal, and suggest that other writers will find it a desirable plan to adopt.

BOOK NEWS.

The long expected book on the Fern Allies * is at last ready. As announced, it is a companion volume to " Our Ferns in Their Haunts," by the same author, and the species have received similar treatment. The cosmopolitan character of a great many of the plants has made it possible to include in this single volume all the species in North America north of Mexico. The species are accurately described from authentic specimens, and all are illustrated, this latter feature being one that has not heretofore been attempted. Everything of interest that is known about each species is given in the text, and there are six keys to the genera and species. There is also a check-list of the species, with synonomy, an extended glossary, and two indexes. The illustrations in black and white number 156, exclusive of the initial letters, and there are eight colored plates. In addition to the illustrations of the species as a whole, there are numerous illustrations of important parts, such as the sheaths in *Equisetum,* the spores of *Isoetes,* and the branchlets and sporophylls of the *Lycopodiums.* It is expected that this book will fill the want that has long existed for a book on the fern allies that describes the species at length.

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* " The Fern Allies of North America," by Willard N. Clute. Illustrated by Ida Martin Clute. New York, The F A. Stokes Co., 1905; pp. 280; $2.00 *net.*

VOTE ON THE CHANGE OF NAME.

Although the notice of this vote intimated that those in favor of it need not vote to be counted for it, nineteen votes were cast in the affirmative. Many of these voters added that they were heartily in favor of the change, or that they had long wished it done. Three votes were cast against the proposition, and will be so counted in the detailed statement in the next Annual Report, though since all three of the objectors had neglected to go through the slight formality of getting the Treasurer's autograph for this year, they would not need to be registered. The original votes will be transmitted to the President.

The Linnæan Fern Chapter organized as a branch of the Agassiz Association in 1893 with nine charter members, thus becomes the American Fern Society with a membership approaching the 150 mark. Its membership includes practically every prominent student of ferns in America, and an organized effort will be made to include every person interested in ferns in the Society. If you have a friend interested in ferns, send us his address, that we may send him the little booklet about the Society soon to be issued.

THE AMERICAN FERN SOCIETY.

Organized as The Linnæan Fern Chapter.

The Treasurer has received from Washington, D. C., the amount of a year's dues to the Society, without an address being given. Will the owner kindly claim the money in order that proper credit may be given?

Since the last Annual Report was printed the following have joined the Society: Miss Belle F. Fletcher, St. Johnsbury, Vt.; Miss Carrie W. Ormsbee, Brandon, Vt.; Lewis S. Hopkins, Troy, Ohio; Albert E. Scoullar, 144 Cherry Street, Elizabeth, N. J.; S. Fred Prince, Lincoln, Neb.' and John A. Anderson, Dubuque, Iowa. The Society has grown steadily from the beginning, and from certain plans which the officers have under consideration, it is expected that an unusual increase in the membership will occur before the end of the year. All who desire to become members of the Society should address the Secretary or Treasurer.

A few of the old members have neglected to pay their dues, and we take this opportunity of again calling attention to the fact. Doubtless these members feel that they have been in the Society so long that it can well afford to wait until they are ready to pay, and in one sense this is quite true; but on the other hand, the Society is committed to a policy of using the funds for the members, instead of hoarding them up as is practiced in many societies, and dues should therefore be paid as soon after the first of the year as they conveniently can be. The Society has always had money enough for running expenses, but any extras that might be secured for members are sometimes unobtainable because dues that are needed are not in.

The Advisory Council is at work preparing the list of candidates to be voted upon at the coming election. Any member who desires to nominate a candidate for office in the Society is cordially invited to send such notices to officers of the Council. The Council, it may be said, consists of all the past Presidents of the Society.

The last date at which members of the Society in good standing can secure a copy of the new book on the Fern Allies at the reduced rate to members has been fixed at September 10th. This reduction has been given by the author to the Society only, and follows the general custom of members who have published books and pamphlets on such subjects.

IMPORTANT NOTICE

We desire to give notice that as we go to press, there are but nine sets of volumes, 6-13 of the FERN BULLETIN remaining. Because of the number of new species described in them these volumes are of special value to Agricultural Colleges, Universities and systematic botanists. Nearly forty sets have been sold in the past two years. The first five volumes are out of print, and Volume VI. can be had only in the nine sets above. Order at once if you want one of these sets.

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The Fern Bulletin

A Quarterly Devoted to Ferns

October

Binghamton, N. Y.
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1905

The Fern Bulletin

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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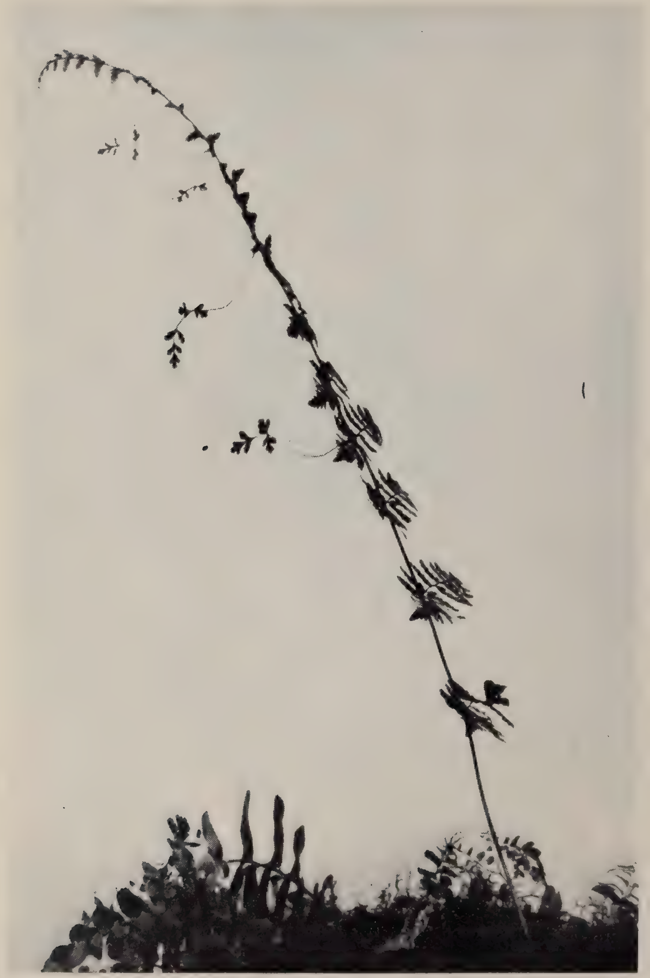

A PRECOCIOUS CYSTOPTERIS.

THE FERN BULLETIN

VOL. XIII. OCTOBER, 1905. No. 4

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SCHIZÆA PUSILLA IN CAPE BRETON.

By GEORGE E. NICHOLS.

It may be of interest to note that this summer I found a new station for *Schizæa pusilla*, in Cape Breton Island. The locality is about two hundred miles northeast of the station reported in 1879 at Grand Lake, Nova Scotia, by Mrs. E. G. Britton; (*Bull. Torr. Bot. Club,* 6: p. 361). The ferns were growing between the hummocks in one of the raised peat bogs characteristic of the so-called "Barrens" of Cape Breton, about ten miles from Northeast Margaree, in Victoria County.

The specimens are very similar to those collected by Mrs. Britton, and compared with the typical form from New Jersey are notably dwarfed, the fertile fronds being hardly two inches high.

Specimens have been placed in the Eaton Herbarium, and others sent to the herbarium of the New York Botanical Gardens and to the National Herbarium.

The circumstances under which I found the fern were not such as to permit my making any very detailed study of the locality. A friend and I had been working our way through the woods for several days, following a blazed trail and carrying packs weighing fifty pounds apiece. The trail disappeared when we came to the barren. It was raining hard and the prospects of another night's camp in the rain were not over enticing. We had been trying to pick up the trail for an hour or so when I happened on *Schizæa*.

As I mentioned before, the fertile fronds are only 2 inches high. I had been on the lookout for mosses more especially, and when I first noticed *Schizæa* I took

DEC 27 1905

it to be a curious *Polytrichum* and went back to look at it.

The plants seemed fairly plentiful, for after finding the first specimen, I noted others in many places on the open, drier parts of the bog. They seemed to select spots where the sphagnum had died away, and where their green, wiry, cork-screw-like sterile fronds were rendered more conspicuous against the light background. In fact I did not detect any plants growing in the living green sphagnum.

The bog seemed remarkably free of ferns of any description. Around the borders of the barren in places was a thick belt of dwarfed spruce, perhaps a hundred yards in width, together with *Sorbus Americana,* while in other places there was no intermediate growth between the enveloping forest and the treeless barren. Especially near the outer zone of the swamp, there were clumps of Cassandra (*Chamædaphne calyculata*) and *Kalmia angustifolia,* while a sparse growth of *Vaccinium Canadense* covered the greater part of the bog.

There were a few small pools in or about which grew *Utricularia cornuta,* together with *Drosera intermedia.* But the bog was remarkably free from surface water despite the heavy rains, and it reminded me of the raised peat bogs of New Brunswick as described by Ganung.

The only other plants I noted were the small "bog-cranberries," which grew in abundance over the entire barren, and one or two dwarfed species of *Aster* and *Solidago* in the drier parts.

Such barrens as this are of frequent occurrence throughout the plateau-like region in the western half of Cape Breton, and are often miles in extent. Though I did not have opportunity to visit any others, it seems hardly probable that *Schizæa* is restricted to this one bog. I was told that the fern had been seen in a bog near Sydney, but did not have time to verify this statement.

Yale University, New Haven, Ct.

A PRECOCIOUS CYSTOPTERIS.

BY G. A. WOOLSON.

Those who know the bladder ferns are familiar with the curious bulblets on the under side of the fertile fronds of *Cystopteris bulbifera*. That these are composed of fleshy scales joined at the base, is understood; also, that after they fall to the ground young plants develop with surprising rapidity, especially if the soil be moist. But that *Cystopteris bulbifera* sometimes covers the step between proliferous buds that fall, and viviparous plants which develop upon the fronds after the fashion of certain exotics, is still an apparently unrecorded fact.

The photo given illustrates this possibility of the species and the precocity of the Vermont specimen which has so successfully adopted foreign methods. This feat was accomplished in a fern-dish on my dining-table, and so unobservant are we of that which is practically under our noses, that the young fronds were one or two inches long before I saw them. The dish was probably filled in May with plants from the grounds about the house and received indifferent care. I noticed late in July that the moss was getting shabby and took it out and replaced it, also breaking off withered fronds. I simply noticed that this now distinguished frond was strong and fresh-looking, consequently left it, knowing that others would develop and fill in as needed. About a month later I happened to rest my eyes upon the ferns from a different angle, and—the coffee and chops cooled off before I recovered from the surprise of a new departure among the natives. Ferns greet me at every turn in my house and *Cystopteris* by the yard grows indoors every summer under similar conditions, and no such "stunts" were ever before attempted. The fern-dish was not exposed to strong sunshine, standing perhaps six feet from an east window, receiving only slanting rays in the morning. Whether the excessive moisture of the season (1905), was an indirect factor in this unusual development is an open question. Dampness certainly had no such effect in shaded ravines, where the growth of normal fronds was simply superb.

No attempt was made to "peg down" the frond and root the young plants, but the frond with its dainty progeny was served up in its prime in behalf of science and presented to the herbarium of the State University. The roots will be rested and future growth carefully watched to see if this special plant will ever do it again and thus gain a right to name as well as fame.

Pittsford Mills, Vt.

OBSERVATIONS ON NORTH AMERICAN PTERIDOPHYTES. II.

By B. D. Gilbert.

Asplenium ebenoides, R. R. Scott. The late James Constable, of Utica, N. Y., was a great lover of ferns and collected them wherever he lived or wherever he went. He left a large folio volume filled with beautifully preserved and mounted specimens, containing nearly all the known species of North America, many of which he had gathered himself, while others were obtained through purchase or exchange. Among these are some particularly fine fronds of *Asplenium ebenoides,* gathered near the Glendon Iron Works, two or three miles from Easton, Pa. The fronds are quite uniform in size, being 24 to 25 centimeters long, but they are peculiar in two respects. Instead of being broadest at the base, as are most of the other specimens I have seen, several of them have the pinnæ growing shorter toward the base, where they are only about one-half the length of the middle pinnæ. Then again, instead of having two, or at most three pairs of lower pinnæ fully separated from the rest, these have half a dozen, and in at least one case a dozen pairs fully separated, with spaces 1 to 1½ centimeters between them. Sometimes the pinnæ are exactly alternate two-thirds of the way up the frond, and two or three pairs of the lower pinnæ are beautifully heart-shaped at base, and attached to the rachis by a delicate but distinct stipe. There seems to be considerable difference in the texture of the fronds, some being very pellucid so as to show the venation with perfect clearness, while others are nearly opaque and so covered with fruit that it is difficult to see the venation distinctly. But so far as I have been able to examine them, I can find no traces of anastomosing, such as Dr. Waters describes in some of his specimens. All the veins seem to be perfectly free, and they all stop short of the edges of the pinnæ.

DICKSONIA PILOSIUSCULA F. NANA, F.N. This species belongs solely to North America east of the Rocky Mountains. Although it was first named by Michaux in 1803, it must have been well known to the earlier botanists, as it is not only common but grows, as none of our other ferns do, in masses covering considerable areas of ground. Yet nothing was ever heard of any pronounced variation in the species until W. R. Maxon published the variety, *cristata* in THE FERN BULLETIN for July, 1899. Three years later, in July, 1902, W. N. Clute published his form *schizophylla*, discovered by A. Vincent Osmun at Andover, Connecticut. To these another is now to be added, the form *nana*, discovered by Dr. C. E. Waters among rocks mixed with micaceous soil at the foot of a steep slope near Lock Raven, Maryland. It resembles *schizophylla* in two respects: the pinnules are similarly incised, and the specimens so far as known are barren of fruit. It differs from that and from the normal form by having the pinnæ round and full-foliaged at the ends, while in most cases as they approach the rachis the pinnules stand farther and farther apart and dwindle to mere green points just above their bases, although the basal pinnules, or one of them, are again somewhat enlarged. The size of the five fronds sent to me varies from 13 to 27 centimeters in length. They are broadest at the base, ranging from 4 to 7 centimeters. The form is rare and pretty.

ATHYRIUM FILIX-FŒMINA VAR. PECTINATUM, WAL-

LICH. A few years ago when I was making a study of the varieties of *A. filix-fœmina*, in this country and had all the material of this species from the seven largest herbaria in America in my hands, I found that the only one which contained the variety *pectinatum* was that of Columbia University. This collection contained two sheets of the variety from Southern Italy. The variety was so distinct that there was no difficulty in recognizing it, and fortunately I found specimens in the same collection from two localities in this country. One of these stations was Blackwater Falls, West Virginia, where it was collected by C. F. Millspaugh in 1891. The other station was Grandfather Mountain, North Carolina, where Small and Heller gathered it in the same year. Correspondence with both of these parties showed that their collections of 1891 had all been distributed long before, and I was unable to add the variety to my own collection. But in June, 1903, among a lot of ferns sent to me by Dr. C. E. Waters, of Baltimore, Maryland, I was delighted to find a fine specimen of *pectinatum* gathered in low, damp woods at Glyndon, Baltimore County, Maryland. When I wrote him about it he answered: "No one with an eye out for ferns could have gone by that *pectinatum*. . . . It was the most beautiful *filix-fœmina* I have ever seen."

It seems desirable that a description of the variety as represented in America should be put on record for the benefit of those who may desire to recognize it. I give the main points, taken from Dr. Waters' specimen, which is nearly twice as large as those in the Columbia herbarium. Stipe 43 centimeters long, dark at base, deeply channelled and sparsely covered with light-brown lanceolate scales nearly 2 centimeters long; rachis not heavy for the size of fern but very flexuose; lamina 68 centimeters long, 50 centimeters wide; internodes of pinnæ about 7 centimeters long; pinnæ shortly petiolate 25 centimeters long in center of frond, 8 centimeters wide, nearly opposite below; alternate above, practically bipinnate, although there is a narrow wing running all along the midrib; pinnules set at a slight angle to the midrib and like the pinnæ opposite below and alternate above, about 24 pairs on the largest pinnæ; segments very regular, about the same length for two-thirds of the pinnule and lacking the greater or less enlargement of lowest anterior segment usually characteristic of varieties of *filix-fœmina*, broad-ended with 4 teeth at end, 1 tooth on inner edge and 2 or 3 on outer edge, each pinnule presenting very much the appearance of a double-edged comb; sori small and rather sparse; texture very thin.

Since receiving Dr. Waters' specimen I have had the good luck to discover the same variety near my own home at Clayville, New York. It is about three-quarters the size of his and shows one sorus on each of about one-half the segments, situated on the lowest anterior veinlet and always hamate.

OSMUNDA CINNAMOMEA F. INCISA, HUNTINGTON. This fern seems to have been first mentioned by Mr. Huntington in THE FERN BULLETIN for January, 1899. I had never seen any specimens of it excepting his until the spring of 1904, toward the end of our long dry spell of weather, I was walking through one of our home swamps dry shod, when I ran right into a large clump of *O. cinnamomea incisa.* It was a peculiar looking plant, especially as some of the fronds were normal, while others were deeply and irregularly incised. Only the upper halves of the fronds were cut, the lower halves being entirely normal. The incisions were very unequal, some pinnæ being quite regularly and deeply toothed, while others had two or three large projections from each side of the pinnule. Other pinnules on the same pinna are perfectly straight-edged, so that these fronds present a ragged, irregular appearance. The swamp where they occur is at present an open one, but 12 or 15 years ago it was wooded, and a small portion of it still remains so. In this wooded area I have found very peculiar and freakish forms of *Nephrodium spinulosum*, so I may be permitted to doubt that the cutting away of the woods and letting in of additional light and air upon this *Osmunda* is responsible for its change in form. It seems to me that all of these variations arise from some inherent tendency of ferns in that direction. It is the life force of the plant trying to express itself in new and different forms.

Clayville, N. Y.

SCOLOPENDRIUM VULGARE IN ONTARIO.

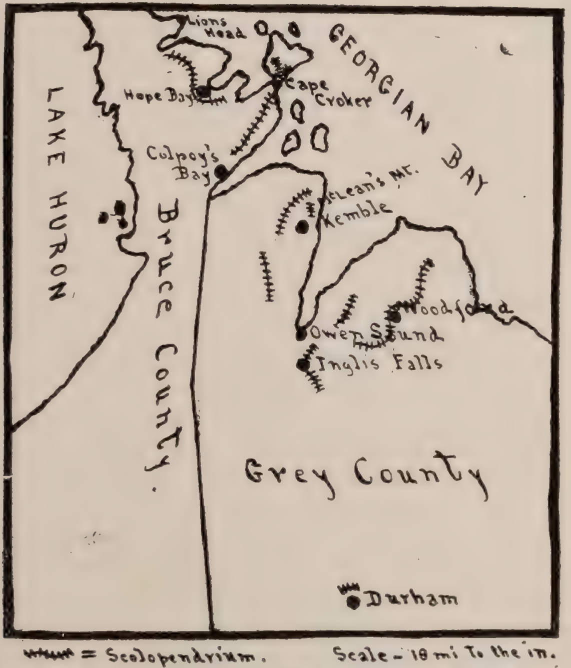
By A. B. Klugh.

Scolopendrium vulgare has been recorded in Ontario only from Owen Sound and Durham, both in Grey County. At the former station it has been collected by Professor Macoun, Dr. Saunders and others. At the latter station it was found by Dr. H. M. Ami. Mr. James White reported it to me from Woodford, Ontario, and Mr. W. E. Saunders reported to me that in June, 1905, he had found it three miles above Colpoy's Bay, thus making the first record for Bruce County.

The month of August, 1905, I spent in determining the range of this plant, and the accompanying map shows the result of the investigation. The whole region is full of out-crops of limestone, which in many places forms ridges and cliffs, some 200 feet in height. Such a cliff runs from Inglis Falls round to Lion's Head, usually near the shore of Georgian Bay, but at some places some one-half mile inland. Eastward from Inglis Falls it runs inland and ends about six miles northeast of Woodford.

Along this ridge, with occasional interruptions of several miles, grows *Scolopendrium vulgare*. It also occurs on out-crops on either side of this ridge. It is most abundant on the top of the ridge north of Woodford at Woodford, at Inglis Falls, north of Kemble, and on the eastern slope of McLean's Mountain. Its favorite habitat is the edge of deep clefts in limestone ridges in heavy shade. It also grows in crevices in mossy rocks in heavy shade. While it never grows in very dry situations, it does not require a damp or even a moist location. At the bases of the cliffs where streams run, it does not grow.

The prothallia I found to be most abundant some three feet down clefts in the limestone ridges, where it was moist and half dark. The largest fronds I found were 13 inches long, and the average length of fronds was 10 inches. Throughout this region it exhibits none of the great tendency to vary which characterizes it in many localities. Of the thousands of plants I examined only two showed any variation, one bore a frond which was slightly forked at the tip, the other a frond with a very irregular outline and a blunt, rounded tip. The indusia



Map Showing the Range of Scolo-
-pendrium vulgare in Ontario.

were just commencing to open during the early part of August.

The constant companion of *Scolopendrium* was *Polystichum lonchitis,* which was usually as abundant or more abundant than the former. At Owen Sound *Scolopendrium* is known as tongue fern and is much used as a house plant; at Kemble it is termed palm fern.

Macdonald Institute, Guelph, Ont.

REVERSIONS AND THEIR FLUCTUATIONS.

BY GEORGE E. DAVENPORT.

The recent tendency on the part of *Nephrolepis Piersoni* to revert to the original Boston form of *N. exaltata* (*var. Bostoniensis*) would seem to show that that fern was an actual sport from *Bostoniensis,* and not the result of accidental crossing in the nursery, as has sometimes been suspected. The precise explanation for this tendency has not been ascertained, but it would be an interesting subject for investigation if one had the time and patience to undertake it. Judging from my own observations the reversion tendency is most observable in some of the newer stock propagated, although I have lately noticed it in the development of new fronds on old plants. But the tendency of all such plants to revert to original forms is well known and is in itself evidence of the plant's origin. Hybrids appear to retain their peculiarities permanently, never seeming to lose altogether the combined characteristics of the parent plants.

I have had under my immediate observation in my fern garden since 1893 the original and a dozen, or more, additional plants of the hybrid fern *Nephrodium cristatum* × *marginale,* and although it has produced some astonishing distortions, it has never produced a single frond that could be said to have reverted to either *N. cristatum* or *N. marginale,* the parent forms from which it was derived. For several years past I have had growing in my fern garden plants of *Dicksonia pilosius-*

cula, var. cristata, and it has been interesting to watch the fluctuations in the variations of different seasons, the percentage of crested forms in some seasons greatly exceeding that of others.

During the past season (1905) the percentage of crested forms has not only been greater than ever before, but the character of the variations has been in every way more striking. Some fronds have not only had the apex of every pinna doubly or trebly crested, but the apex of the frond itself has frequently been bifidly divided with heavily crested apices. Having put in press a goodly number of fronds during the season, I will be glad to send a specimen to any member of the Fern Society not having one, and desiring it, if stamps are sent for postage. This fern is singularly beautiful in the garden and my plants have excited the admiration of all who have seen them.

Another unique fern, which I have had growing this year for the first time, *Nephrodium Thelypteris Pufferæ* (A. A. Eaton)—has shown a marked tendency to revert to the original form. This has been most observable in the fertile fronds, the retention of its varietal peculiarities having been strongest in the sterile.

I do not expect, however, that my plants will become strongly established before another year, when these conditions may be reversed. This fern lacks the grace and beauty of the crested *Dicksonia*, but is more unique and curious. Its characters have been well described by A. A. Eaton, and will probably hold good with similar fluctuations to those of the *Dicksonia*.

Medford, Mass.

MRS. TAYLOR'S GEORGIA FERNS.

By B. D. Gilbert.

The collection of ferns made by Mrs. E. B. Taylor near Thomasville, Ga., during the season of 1905, is the most significant and valuable in its entirety of any that has been made since Mr. A. A. Eaton made his discoveries in Southern Florida in the winter of 1903-4. Mrs. Taylor has already written of them most charmingly for readers of The Fern Bulletin, but I wish to speak of a few of the species purely from a botanical point of view.

Nephrodium molle Desv. has for some time been one of the uncertainties of our flora. This species is so much like *N. patens* that it is difficult to distinguish unless one is familiar with both species, but when once known, its venation renders it unmistakable. It was to be expected that a fern which is so common in the West Indies should appear in Southern Florida, and Mr. Clute has already shown that it is there in abundance. But one would hardly look for it as far north as Georgia. Mrs. Taylor's specimens are true *N. molle,* however, and they mark the northern limit of the species so far as is now known, being about 2½ degrees farther north than the Florida stations. It seems quite likely, however, that the Georgia specimens have escaped from cultivation. They are probably not of native growth, but the soil and climate are propitious for them.

Lygodium japonicum Sw. is a species which might easily become naturalized under favorable conditions. It fruits freely and its spores germinate easily wherever they fall, as may often be seen in greenhouses where the fern is cultivated and where it clambers over everything within reach. Mrs. Taylor's specimens were gathered in and near a deep ditch about three miles from Thomasville, where a fence had separated the ditch from a greenhouse that had been destroyed by fire, and the spores of the fern had found shady and congenial lodging places nearby. This is a distinct addition to our naturalized flora.

Nephrodium Floridanum Hook. makes a new record in appearing at Thomasville. Hitherto it seems to have been reported only from Florida, Alabama and Louisiana; but at Thomasville it grows in great luxuriance in shade on the hammocks, and is the most noticeable species of the region.

Adiantum hispidulum Sw. Mrs. Taylor's specimens of this fern differ from typical specimens from New Zealand, Ceylon and other East Indian islands. While the fronds are abundant and of normal size, the fruit, which it usually produces so prolifically, is very sparse on these specimens, the venation is more strongly striated, the upper and outer edges more deeply serrated, the pinnules falcate, and instead of standing at right angles to the rachis, or nearly so, they stand at an angle of about 60 degrees to it, as they do in *A. pedatum rangiferinum*. These features give it a peculiar character, induced perhaps by its environment, as it grows in a hanging position in the red clay walls of old wells and under the edges of verandas. In fact, it is so distinct that it seems worthy of a formal name, and I have designated it

Adiantum hispidulum f. strictum f.n.

Type consisting of two plants in Gilbert herbarium. Habitat in old well near Thomasville, Ga. Collected by Mrs. Elfreda Bennett Taylor, September, 1905.

Clayville, N. Y.

A CHECK LIST OF THE NORTH AMERICAN FERNWORTS.

By Willard N. Clute.

The making of fern lists began in America somewhat earlier than the making of fern books themselves, and has continued with increasing interest to the present. The grace and beauty of the ferns, the ease with which they may be preserved and the great variety of species found in our part of the world have all fostered the collecting spirit which is at the very foundation of fern study, while the fern lists have afforded a convenient means of check-ing up the species in single localities and of indicating specimens for exchange. The early lists show very clearly that they were intended to be used merely as labels and exchange lists. They were printed on but one side of the paper and were simply lists of names. Apparently no notice was taken of the plants which we call the fern allies. Ferns, alone, interested the first collectors. Gradually other matter began to creep into the lists such as the common names, synonomy, distribution, abundance, etc., and finally the fern allies were added. A further improvement was made in numbering each species so that collectors instead of writing the name of each species could list the species desired by simply setting down their numbers.

The first fern list of which I can find a trace was issued by John Robinson in 1873, and entitled "A Check List of the Ferns of North America." In 1876 a second edition with various changes was issued. This contained 146 species and varieties, among them several that were wrongly referred to our region, such as, *Adiantum chilense*, *Adiantum pilosum* and *Aspidium Ludovicianum*. About this time William Edwards began his fern list which finally received the title of "A Catalogue of North American Ferns." Edwards has the unique distinction of being the only maker of a fern list which appeared in more than two editions. His "Catalogue" passed through no less than five. The fourth edition, which was the first to bear the title here given, appeared in 1876 and the final edition in 1879. In this latter year appeared the "Catalogue of the Davenport Herbarium," by George E. Davenport, and the next year saw the publication of D. C. Eaton's "Systematic Fern List," which contained the geographical range of all the species and in which the species were consecutively numbered. This list contained 164 species and varieties. Another fern list, not very well known, was issued by S. Stebbins in Springfield, Mass., in 1878. This was a simple list of names printed on one side of thin paper. A similar list was issued by G. E. Davenport in 1883.

For ten years or more after the publication of these lists interest in ferns appears to have slumbered. It was awakened by the publication in 1895 of the modest little "Bulletin No. 9" of the Linnean Fern Chapter, under the editorship of the present writer. Its full title was "The Pteridophyta of North America." This list was consecutively numbered, gave the geographical distribution of each species and so far as known was the first list in America to include the fern allies. As an indication of the trend of study since, it may be added that no subsequent list has omitted them.

At the time the Fern Chapter list was issued, it was felt that it was not adequate to the needs of collectors, and shortly thereafter William R. Maxon at the suggestion of the writer began a new list which was finally published in 1901 in the "Proceedings of the U. S. National Museum" under the title of "A List of the Ferns and Fern Allies of North America." This list is not consecutively numbered, but gives the principal synonyms of the species and very careful data regarding distribution. It is the only list thus far issued that uses the "new" nomenclature and is based on a radical conception of species.

Mr. B. D. Gilbert's "North American Pteridophytes" also appeared in 1901. This list is the exact opposite of Maxon's list in matters of nomenclature and the limitation of species and much excels that work in the number of forms and varieties included. It is consecutively numbered and has served as the standard for most of the exchanging that has been carried on since.

In presenting a new list I have been actuated not only by the fact that all these lists except Mr. Gilbert's is out of print, while the demand continues to increase, but by the fact that a large number of species and varieties have been named since that list was issued, necessitating a list brought down to date. I have attempted to include in this list every species, sub-species and form that has been described from the region. All of these are listed in **black-face** type. Synonyms are in italic and are separated from the species to which they refer by a dash. In the case of forms the synonomy (in parenthesis) follows immediately after the stated distribution of the form.

I have also attempted to give in a general way the comparative abundance of the species. That this can only be general is manifest from the unequal distribution of the species. No one would be inclined to call *Schizæa pusilla* abundant, and yet in some of the localities where it grows it is abundant. In general the comparative abundance may be understood to refer to the regions in which the species grows naturally and to refer to the center of its distribution and not to the extremes. The list is not intended to take the place of the various Fern Floras now being issued in The Fern Bulletin. There are often large areas in the given range of any species in which the species may be absent. The lesser floras will always be able to define the limits of a species better than any general list. Only such "common" names have been given as are in common use.

The nomenclature, it need scarcely be said, is conservative and in practical accord with that used by fern students in other parts of the world. In America two methods of writing the scientific names are in vogue. One considers that no species is properly named until the correct specific and generic name is joined and would write as the author the name of the one who first correctly joined them; the other takes into consideration the rights of the one who gave the valid specific name and would write after the species the name of the author. If the species was later combined with some other generic name the author of the species is enclosed in parenthesis and the name of the author of the new combination written after it. I believe that this latter practice offers altogether too great inducements to nomenclaturists to change names and so have followed the practice of zoologists in leaving off all but the name of the author of the species. When a name in parenthesis follows the specific name it is to be assumed that the name has been transferred to some other genus than the one in which it was described.

Since there are no hard and fast lines for distinguishing species, our so-called species are largely matters of opinion, and in the arrangement of the list I have been guided by the principles laid down in my paper entitled "Species and Varieties Among the Ferns," recently published in THE FERN BULLETIN. The geographical distribution of the species and forms has been brought up to date and the distribution outside of our limits has also been added. It is hoped that the tables of classes, orders, etc., may be useful as an aid to fixing the relationships of the various groups in the minds of young students.

MAIN GROUPS OF THE FERNS AND FERN ALLIES.

SERIES I.—FERNS. Spores minute, alike in size, borne on the backs of broad leaf-like fronds or occasionally in berry-like spikes.

ORDER 1.—Prothallium subterranean, pale; vernation of the fronds straight or inclined. Eusporangiate. OPHIOGLOSSALES.

ORDER 2.—Prothallium terrestrial or epiphytic, green; vernation of the fronds circinate. Leptosporangiate. FILICALES.

SERIES II.—FERN ALLIES. Spores minute, alike in size or of two sizes, one much larger than the other, borne usually in the axils of the leaves. Plants of varying aspect; leaves not fern-like.

ORDER 3.—Spores of two sizes borne in sporocarps. Water plants rooting in mud or floating on the surface of still water. SALVINIALES.

ORDER 4.—Spores all alike, borne on the under side of peltate scales assembled in cone-like catkins. Plants usually of moist places; leaves scale-like, stems hollow. EQUISETALES.

ORDER 5.—Spores of one size (in Lycopodiaceæ) or of two sizes (in Selaginellaceæ) borne in the axils of scale-like leaves usually forming cones. Plants of dry or moist places; stem usually creeping. LYCOPODIALES.

ORDER 6.—Spores of two sizes in the axils of quill-like leaves. Water plants, nearly stemless, with leaves in rosettes. ISOETALES.

THE CLASSES, ORDERS, FAMILIES AND GENERA OF THE PTERIDOPHYTA.

(According to Relationships.)

CLASS FILICINEÆ.
- ORDER OPHIOGLOSSALES.
  - Family Ophioglossaceæ.
    - Genera: *Botrychium, Ophioglossum.*
- ORDER FILICALES.
  - Family Osmundaceæ.
    - Genus: *Osmunda.*
  - Family Schizæaceæ.
    - Genera: *Aneimia, Lygodium, Schizæa.*
  - Family Hymenophyllaceæ.
    - Genus: *Trichomanes.*
  - Family Parkeriaceæ.
    - Genus: *Ceratopteris.*
  - Family Polypodiaceæ.
    - Genera: *Acrostichum, Adiantum, Aspidium, Asplenium, Athyrium, Blechnum, Camptosorus, Cheilanthes, Cryptogramma, Cystopteris, Davallia, Dicksonia, Gymnogramma, Lomaria, Meniscium, Nephrodium, Nephrolepis, Notholæna, Onoclea, Pellæa, Phegopteris, Polypodium, Polystichum, Pteris, Scolopendrium, Struthiopteris, Tænitis, Vittaria, Woodsia, Woodwardia.*
- ORDER SALVINIALES.
  - Family Salviniaceæ.
    - Genera: *Azolla, Salvinia.*
  - Family Marsiliaceæ.
    - Genera: *Marsilia, Pilularia.*

CLASS EQUISETINEÆ.
  ORDER EQUISETALES.
    Family Equisetaceæ.
      Genus: *Equisetum.*

CLASS LYCOPODINEÆ.
  ORDER LYCOPODIALES.
    Family: Lycopodiaceæ.
      Genus: *Lycopodium.*
    Family Psilotaceæ.
      Genus: *Psilotum.*
    Family Selaginellaceæ.
      Genus: *Selaginella.*

CLASS ISOETINEÆ.
  ORDER ISOETALES.
    Family Isoetaceæ.
      Genus: *Isoetes.*

THE TRIBES AND GENERA OF THE POLYPODIACEÆ.

TRIBE 1. WOODSIEÆ.—Sori dorsal, round or oblong; indusium inferior.
  Genus: *Woodsia.*

TRIBE 2. DAVALLIEÆ.—Sori marginal or median, round or transversely oblong; indusium interior, the margin of the frond often forming a second indusium.
  Genera: *Cystopteris, Davallia, Dicksonia.*

TRIBE 3. ADIANTEÆ.—Sori marginal, linear, oblong, reniform or roundish; inserted on the inner side of the reflexed papery margin of the frond.
  Genus: *Adiantum.*

TRIBE 4. PTERIDEÆ.—Sori marginal, linear or short oblong; indusium exterior, of the same shape as the sorus.
  Genera: *Cheilanthes, Cryptogramma, Hypolepis, Notholæna, Pellæa, Pteris.*

TRIBE 6. LOMARIEÆ.—Sori dorsal, transverse, linear, sub-costal; indusium exterior, of the same shape as the sorus.

Genera: *Blechnum, Lomaria, Woodwardia.*

TRIBE 7. ASPLENIEÆ.—Sori linear or oblong, dorsal along the veins, single or double; indusium linear or oblong.

Genera: *Asplenium, Athyrium, Camptosorus, Scolopendrium.*

TRIBE 8. ASPIDIEÆ.—Sori dorsal, terminal on the veins, round or reniform; indusium peltate or reniform.

Genera: *Aspidium, Nephrodium, Nephrolepis, Onoclea, Polystichum, Struthiopteris.*

TRIBE 9. POLYPODIEÆ.—Sori round or oval, dorsal or terminal on the veins; indusium absent.

Genera: *Phegopteris, Polypodium.*

TRIBE 10. GRAMMATIDEÆ.—Sori arcuate, oblong or linear, often reticulated, usually dorsal; indusium absent.

Genera: *Meniscium, Gymnogramma.*

TRIBE 11. VITTARIEÆ.—Sori linear, costal or submarginal, sunk in a groove, or superficial.

Genera: *Tænitis, Vittaria.*

TRIBE 14. ACROSTICHEÆ.—Sori without definite form, usually covering the underside of the pinnæ. Fronds usually dimorphous.

Genus: *Acrostichum.*

OPHIOGLOSSACEÆ.

BOTRYCHIUM Sw.

1. **Botrychium biternatum** (Lam.). GRAPE-FERN. Rare; in old fields and thickets. Carolina, Georgia and Alabama. Fruits in spring.—*B. ternatum lunarioides* D. C. Eaton.
2. **Botrychium boreale** (Fries). Rare. Unalaska; also in northern Europe and Asia.
3. **Botrychium lanceolatum** (Gmel). LANCE-LEAVED GRAPE-FERN. Not common; in moist shades, especially in beech and maple woods, usually in colonies. New Jersey, Ohio, Colorado and Washington, northward; also in Europe and Asia.
4. **Botrychium lunaria** (L.). MOONWORT. Rare; in old fields and pastures and on moors. New York and Colorado northward; also nearly throughout the world. The form from central New York is **B. lunaria Onondagense** Underw. (*B. Onondagense* Underw.).
5. **Botrychium matricariaefolium** A. Br. MATRICARY GRAPE-FERN. Rare; in moist shades, usually growing with *B. lanceolatum*, but fruiting somewhat earlier. Maryland, Ohio and Washington, northward; also in Europe.—*B. neglectum* Wood.
6. **Botrychium matricariaefolium tenebrosum** (A. A. Eaton), Rare; in maple woods. New York and New England. A slender form growing beneath fallen leaves.—*B. tenebrosum* A. A. Eaton.
7. **Botrychium pumicola** Coville. Crater Lake, Oregon. By some regarded as a form of *B. lunaria*.
8. **Botrychium simplex** E. Hitchcock. LITTLE GRAPE-FERN. Rare; in moist woods and meadows. New York and northern New England, northward. Insignificant forms have been named **compositum, fallax, incisum, simplicissimum** and **sub-compositum.**

9. **Botrychium ternatum obliquum** (Mühl.). COMMON GRAPE-FERN. Common; in moist woods and thickets nearly throughout America. Our plant, though closely resembling the Japanese *B. ternatum* (Thunb.), is not considered identical with it.—*B. obliquum* Muhl.

The form **Coulteri** is from the Rocky Mountain region (*B. Coulteri* Underw.); **f. dissectum** is a dissected form occurring with the common form (*B. dissectum* Spreng.); **f. intermedium** is found in Indiana, New York and New England (*B. ternatum intermedium* D. C. Eaton); **f. matricariae** is reported from New York and New England, northward (*B. matricariæ* Schrank); **f. Oneidense** is a small, less divided form found with the type (*B. Oneidense* Gilbert); **f. robustum** is from Unalaska (*B. rutæfolium robustum* Rupr.); **f. silaifolium** is a form from the West Coast (*B. Californicum* Underw.; *B. occidentale* Underw.; *B. ternatum australe* D. C. Eaton; *B. obliquum Habereri* Gilbert); **f. tenuifolium** is a slender form from the Gulf States (*B. tenuifolium* Underw.).

10. **Botrychium Virginianum** (L.). RATTLE-SNAKE FERN. Common; in moist shades nearly throughout North America; also in the West Indies, Europe and Asia. Very small forms found with the type have been named **gracile** (*B. gracile* Pursh); the form from Jamaica in which the sterile portion of the frond lasts through the winter has been named *B. dichronum* Underw.

OPHIOGLOSSUM L.

11. **Ophioglossum Californicum** Prantl. Rare. Southern California.

12. **Ophioglossum crotalophoroides** Walt. Rare. South Carolina and Florida to Texas; also in South America.—*O. bulbosum* Michx.

13. **Ophioglossum palmatum** Plumier. Rare. Florida; also in tropical America.—*Cheiroglossa palmata* (L.).

14. **Ophioglossum pusillum** Nutt. Rare. Georgia and Florida to Texas.—*O. nudicaule* L. f.

15. **Ophioglossum vulgatum** L. COMMON ADDER'S-TONGUE. Not uncommon; in moist meadows and pastures. Southern Canada to the Gulf of Mexico west to California; also in Europe, Asia, Africa and Australia.

The form **arenarium** is a depauperate form from New Jersey (*O. arenarium* E. G. Britton); **f. Alaskanum** is from Unalaska (*O. Alaskanum* E. G. Britton); **f. Engelmanni** is an apiculate form from Virginia to Missouri and Arizona (*O. Engelmanni* Prantl.).

OSMUNDACEÆ.

OSMUNDA L.

16. **Osmunda cinnamomea** L. CINNAMON FERN; BRAKE. Abundant; in wet woods, open swamps and in pastures. Florida and the Mississippi Valley to Nova Scotia; also in the West Indies, Japan and Eastern Asia.

The form **frondosa** Gray with sporophylls partly changed to vegetative organs occurs with the type; **f. glandulosa** Waters is a form with glandular fronds found in dryish situations; **f. incisa** Huntington is an incised form occurring with the type.

17. **Osmunda Claytoniana** L. INTERRUPTED FERN. Abundant; in wet woods and swamps and along moist roadsides. North Carolina and Missouri, northward; also in India. The form **dubia** Grout is a dissected form from Vermont.

18. **Osmunda regalis** L. ROYAL FERN; FLOWERING FERN. Abundant; in moist shades and swamps,

often in standing water. New Brunswick to Mississippi, Nebraska and the Northwest Territory; also in Mexico, Europe, Asia and South Africa.—*O. spectabilis* Willd.

SCHIZÆACEÆ.

Aneimia Sw.

19. **Aneimia adiantifolia** Sw. Tolerably common; in moist open places. Florida; also in the West Indies and Mexico.—*Ornithopteris adiantifolia* (L.).

19a. **Aneimia Mexicana** Klotzsch. Rare. In moist places Texas and Mexico to Honduras.—*Ornithopteris Mexicana* (Klotzsch).

Lygodium Sw.

20. **Lygodium Japonicum** Sw. Japanese Climbing Fern. Naturalized near Thomasville, Georgia.

21. **Lygodium palmatum** Bernh. Climbing Fern; Hartford Fern. Not uncommon; in moist shades from New Hampshire and Massachusetts to Florida mostly near the coast; also in Kentucky and Tennessee.

Schizæa J. E. Smith.

22. **Schizaea pusilla** Pursh. Curly Grass. Rare and local. Often found abundantly in limited areas. New Jersey, Nova Scotia, Cape Breton and Newfoundland. Found in cranberry bogs.

(*To be continued.*)

Miss Caroline G. Soule writes that *Azolla Caroliniana* grows abundantly on the water in Forest Park, Springfield, Mass. Owners of extensive grounds in other parts of the Northern States would find this plant worth naturalizing.

NOTES.

A specimen of *Botrychium Virginianum* with two panicles of fruit and two additional fertile pinnules on the sterile part of the frond is illustrated in *Torreya* for September, 1905.

Recent affairs in the Far East have turned the attention of other parts of the world to many things Japanese, among them the use of bracken crosiers as food. Their preparation is thus described in *Indian Gardening:* The young stems are cut off before the leaf has developed, and are laid to soak in water and wood ashes for two days in order to get rid of the bitter taste. They are then boiled like asparagus.

With a printing-frame, such as photographers use, and some velox or solio paper, Dr. R. J. Smith, Milpitas, Calif., has produced some very excellent prints of fern fronds. In practice the fern to be printed is laid next to the glass of the printing-frame, the solio or other paper put next to it and then exposed to strong sunlight for a considerable time. By dissolving one grain of aniline in a pint of water and placing the stipes of the fronds in this for a few hours before printing the veins will take up the color and show distinctly in the print.

In a letter dated September 20th, recently received by the treasurer of the Fern Society from a member, George E. Smith, Esq., of Aratapu, Northern Wairoa, New Zealand, the writer says: "I am looking forward to a favorable season for my ferns, of which I have a considerable number and which are just now beginning to unfold their new fronds. One of them is your lady fern (*Athyrium filix-fœmina*). I think it is such a pretty fern, so beautiful and green. Our ferns are mostly all evergreen and so the "bush" never has that withered and desolate appearance that we see at winter time the other side of the world. One can hunt ferns here all winter with nothing else to incommode him but wet feet, which is in striking contrast to frost and snow."

In the "Proceedings of the Biological Society of Washington" for December 27, 1904, Aven Nelson described a new spleenwort from Colorado as *Asplenium Andrewsii.* It appears to be a form of *Asplenium Bradleyi* from the description, but as no plate of the species is given it is difficult to decide. It is said by the collector to grow on the face of a white sandstone cliff along Boulder Creek, Colorado, for a mile or more, being abundant for most of the distance.

According to *Gardening World* a sample of *Osmunda regalis* received from Yokohama, Japan, was recently exhibited before the Royal Horticultural Society by Mr. Charles T. Druery, who stated that some tons of this plant are annually consumed by the Japanese as food. In appearance the material was almost black, extremely tough and hard with a bituminous smell. It is prepared by collecting the young fronds of the fern when about ten or twelve inches high before the fronds have unfolded. These are then boiled, dried and compressed ready for the market. When used later it is soaked for some hours, becoming soft and olive green in color. Upon being boiled it becomes still softer and is said to be not unpalatable when served up with sauce after the Japanese way.

It is difficult for the beginner to keep up with the proteus-like changes in some of our common species. A few years ago a certain Californian plant was known as *Botrychium ternatum australe.* When changes in nomenclature became the fashion it was first called *Botrychium australe*, later *Botrychium silaifolium* and now it is *Botrychium Californicum*, or rather it was, last June. The name may have been changed since. Professor Underwood's studies incline him to believe that the plants from Northwest America until recently called *Botrychium occidentale* are more like Presl's description of *Silaifolium*, and in consequence the specific name *occidentale* is now no more. The transference of *silaifolium* to the plants referred to as *occidentale* thus leaves an opportunity for a new name to be applied to the California plants. It is to be noted that Professor Underwood thinks there is still another intermediate form between the California plants and those farther north. Knowing the variations in this genus, we are inclined to think there are not one but many intermediate forms.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

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UNDERWOOD, L. M. *Botrychium Silaifolium.* Torreya, Je. 1905.

EDITORIAL.

As most readers of this magazine are aware, the editor is about a thousand miles away from home for the greater part of each year and obliged to edit the magazine at long range. This is bound to produce some irregularity in the time at which the numbers appear, but we wish here to emphasize the fact that for thirteen years the magazine has never skipped an issue, has never combined two issues in one, and has never given less for the money than it agreed to do. Moreover, it never will. It is the third oldest botanical magazine in America, and expects to continue in business until it tires its two seniors out if the editor does not die of old age in the meantime. Long ago, before the magazine had patronage enough to enable it to pay its own bills, the editor cheerfully went down in his pocket for the deficit; and now that it can pay its way the editor gets an enjoyment out of its prosperity that is not measured in mere coin. The magazine is not run as a money-making proposition; it is one of the editor's forms of recreation. He gets more pleasure out of it than anybody else connected with the magazine. Perhaps this is why the magazine has lasted so long; anyway, this is why we expect it to last much longer.

⁂

As we have looked over the copy for this issue, it has struck us that this is a little the best number that has ever appeared. Its value, however, is not due in any way to the efforts of the editor, but rather to the articles received from our contributors; therefore we can speak of it without boasting. We expect the fourteenth volume to be equal to this in all respects and solicit articles and notes from every reader. We expect to continue the fern floras of the States, and the check-list of the fernworts. The series of illustrations and descriptions of exotic ferns will continue, with here and there digressions for such illustrations as appear in this issue. As for the rest, it will be what our contributors make it. In this issue we send bills for a year in advance with arrears, if any, added. We trust that we may have a prompt reply from all. But why bother each year with sending 75 cents? Why not send $1.25 for two years or $2.00 for three years, and save the discount. These rates, however, apply to payment in advance and not to subscriptions in arrears.

* *
*

At this writing the editor expects to attend the meeting of fern students in New Orleans during the Holidays and will present a paper on the tropical ferns likely to be found in the Southern States, with observations on those that have already been found there. New Orleans is an ideal city for a winter meeting, and it is hoped that a large number of the readers of this magazine will be able to attend. If the weather is favorable trips will be made to the haunts of *Azolla Caroliniana, Marsilia uncinata, Selaginella Ludoviciana, Equisetum robustum, Pteris longifolia, Ceratopteris thalictroides, Nephrodium patens* and various other desirable species of fernworts.

* *
*

Last summer, the editor had the pleasure of a trip to Mount Tom, in Massachusetts, from which a magnificent view was had of a vast sweep of picturesque country, with Wachusett, Monadnock, and Greylock peeping up on the distant horizon, and Mt Holyoke and the long ridge of trap-rock of which it is a peak, in the middle distance. But turning from these things, he was possibly as much interested in two little fernworts, that, in spite of the crowds of visitors to this elevated region, live and flourish everywhere. Even at the Summit House where the walk divides to go round a rocky point, the two were growing vigorously within six inches of the boards. These species were the rusty woodsia and the rock selaginella, both rare so far as the experience of fern collectors in general goes, but common enough in their chosen haunts. We are often told of the liking of various ferns for limestone rocks, and the slender cliff-brake and walking fern are cited as instances, but the liking of the woodsia and selaginella for trap rock seems fully as pronounced, though seldom commented upon. It would be interesting to know whether these two species ever grow in as great profusion away from their favorite soil.

BOOK NEWS.

One of the results of the recent stay in California of Mr. and Mrs. C. F. Saunders is a series of a dozen panels from water-color drawings of "California Wild Flowers" by Mrs. Saunders. These have been reproduced by the three-color photo process and in coloring closely simulate the originals. The artist has not only been happy in her selection of subjects, but in the decorative arrangement of the drawings has shown much artistic ability. Accompanying each drawing is a sheet of excellent descriptive text which we suspect is the work of Mr. Saunders. The price of the set of drawings is $1.50.

It would be difficult to find a work requiring more care and labor than the "Index Filicum"[1] of which Carl Christensen has issued the first four fascicles. In this work the author contemplates making a volume that will stand in relation to ferns much as "Index Kewensis" stands to flowering plants. When completed the "Index Filicum" will consist of three parts (1) a systematic enumeration of the genera, (2) an alphabetical enumeration of the species and synonyms, and (3) an alphabetical catalogue of fern literature. The first three fascicles begin the list of species and synonyms and carry it through 192 pages to *Cyathea*. Among the large genera included are *Adiantum, Asplenium, Botrychium* and

[1] Index Filicum by Carl Christensen. To be published in about 12 parts. 75 cents a part. 4 parts issued. Copenhagen, Denmark; H. Hagerups Boghandel, 1905.

Cheilanthes, and we are able to form a fair opinion of what the work as a whole will be. In the reviewer's opinion it is certain to prove absolutely indispensable to all who work with the ferns. The valid species are printed in black-faced type, the synonyms in Roman, and the gardeners' varieties in italic. Following each entry is the full citation of the place of publication. The valid species have their geographical distribution recorded and the synonyms are referred to the species under which they belong. The work is based upon the system of Engler and Prantl, but Hooker and Baker's " Synopsis Filicum " and Christ's " Farnkrauter der Erde " have been carefully consulted, and the author has had the assistance of Dr. Christ in the preparation of the manuscript. The entire work, which has required several years of preparation, is now ready for printing, and the publication is to proceed rapidly as soon as the size of the edition can be ascertained. Fern collectors will find this work second only to " Synopsis Filicum " in importance and will no doubt welcome the opportunity to subscribe for it. To carry the work through to completion rapidly the author needs about one hundred more subscribers.

THE AMERICAN FERN SOCIETY.

Formerly Linnæan Fern Chapter.

Messrs. R. C. Benedict, Syracuse, N. Y., and Chas. C. Deam, Bluffton, Ind., Mrs. Frank B. Comins, Sharon, Mass., and Miss M. E. Fox, Portland, Maine, have recently joined the Society.

As this number goes to press, the annual election is being held. All the present officers have been renominated, and in order to give members a choice, Mr. F. G. Floyd, West Roxbury, Mass., has been named as candidate for president of the Society, Mr. J. B. Flett of Tacoma, Wash., for vice president, Miss Elmira E. Noyes, Portsmouth, Va., for secretary, and Mrs. O. P.

Phelps, Chapinville, Conn., for treasurer. The full report of the election will appear in the Annual Report. The president has appointed as judge of elections, Miss Harriet Wheeler, Chatham, N. Y.

Owing to the sudden departure of Mr. C. F. Saunders for California, where he will have no settled address for some time, annual dues may be forwarded to the Secretary, Willard N. Clute, Joliet, Ill., until further notice.

FIFTH MEETING OF FERN STUDENTS.

A fifth meeting of fern students, under the auspices of the American Fern Society, will be held in New Orleans in January in connection with the meetings of the American Association for the Advancement of Science, which continue from December 29 to January 4. A stated meeting of the Fern Society for the reading of papers and the transaction of other business will be held on Tuesday, January 2nd. Various field trips will be made if the weather permits. At this date it is too early to give more definite information, but those who expect to attend will be kept informed of the plans by applying to the president or secretary of the Society. Both these officers expect to be present at the meeting and a pleasant and profitable session is anticipated. Fern students who wish to present papers at the meeting are requested to send titles to the president or secretary as soon as convenient. Prof. R. S. Cocks, the well-known fern student of New Orleans, will have charge of the local arrangements.

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A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XIV

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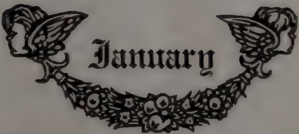

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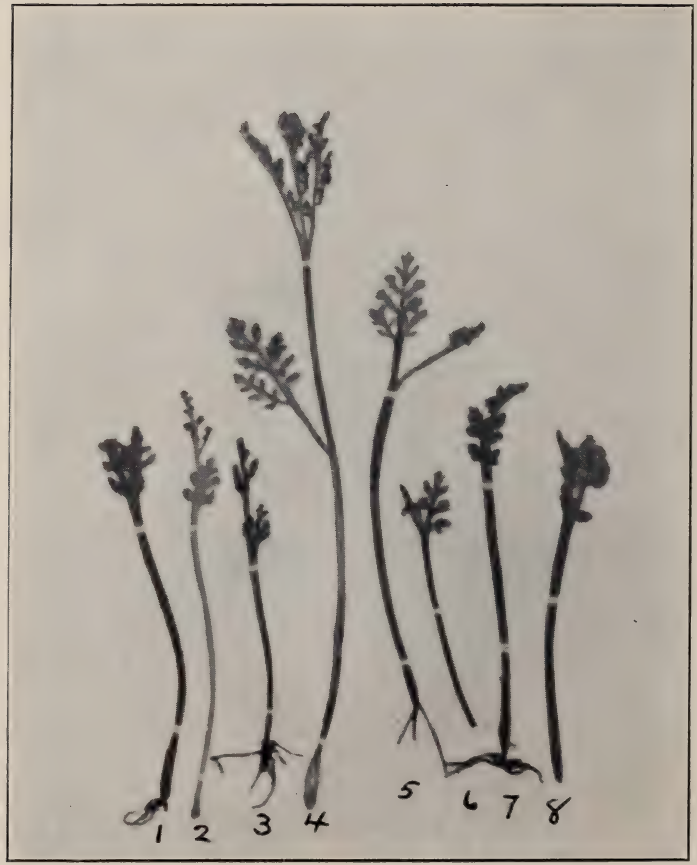

PLATE I

FORMS OF BOTRYCHIUM MATRICARIÆFOLIUM

THE FERN BULLETIN

Vol. XIV. JANUARY, 1906. No. 1

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THE FERN FLORA OF CONNECTICUT.

By Charles H. Bissell.

The little state of Connecticut forms the southwestern corner of the group of six states generally known as New England. It has an average width of about sixty miles, from north to south, and from east to west a length of over ninety miles. Its southern boundary is formed by the waters of Long Island Sound. The general contour is a series of hill ridges extending north and south, reaching their greatest elevation along the northern border and decreasing gradually in height as they approach the seashore. The highest point in the state is in the extreme northwestern corner where Bear Mountain reaches an elevation of 2355 feet. The state is cut across from north to south by three rivers, the Housatonic to the west, the Connecticut in the central part, and the Thames to the east; except for small streams emptying directly into Long Island Sound practically the entire surface of the state is drained by these rivers. Small lakes and ponds abound, but Bantam Lake, in the town of Litchfield, noted as the home of *Marsilia,* is the largest body of fresh water in the state, being about three miles long with an average width of at least three-fourths of a mile.

The greater part of the rock formation is granitic in character, but other forms occur. A belt of Connecticut River sandstone stretches across the state from north to south in the central part, and this in places is mingled with ridges or dykes of trap rock. In the northwestern part of the state are districts where the

APR 4 - 1906

prevailing rock is limestone. Geological formations have an important bearing on the distribution of ferns and we have enough of the basalt and limestone to furnish homes for a number of species that prefer such a habitat.

The more interesting parts of the state have been very thoroughly botanized for many years, but in spite of this fact several of the rarer species listed are of recent discovery. It has not been thought desirable to increase the number of species and varieties by listing all the slight variations or abnormal forms that have at some time been described. Only those varieties seeming to have in this region well marked and permanent characteristics are given a place in the list. Further study may show that some of these excluded forms are good varieties and give them a place in future publications. The nomenclature used is in accordance with the new Vienna code adopted by the Vienna Congress of 1905.

POLYPODIACEÆ.

Polypodium vulgare L. Common Polypody. Frequent throughout on shaded ledges. The form known as var. *Cambricum* with broader pinnæ and cut segments sometimes occurs.

Phegopteris polypodioides Fee. Long Beech-fern. In rich moist woods and on shaded banks; rare or local in eastern and southern districts, becoming common to the northwest.

Phegopteris hexagonoptera Fee. Broad Beech-fern. Frequent of occasional in rich woods, either moist or dry, throughout. Some forms approach *P. polypodioides* Fee. in appearance.

Phegopteris Dryopteris Fee. Oak Fern. Rocky woods in rich moist soil. Rare or local over most of the state, becoming frequent to the northwest.

Adiantum pedatum L., Maidenhair. In rich woods frequent throughout.

Pteris aquilina L. BRAKE. Common in open woods and thickets, usually in dry sandy soil.

Cheilanthes lanosa Watt. HAIRY LIP-FERN. Known from only one station in the state, growing on the precipitous face of West Rock, New Haven. Discovered there by Mr. Gilbert van Ingen (see FERN BULLETIN, IX-7). This is called the northern limit of the species.

Pellœa atropurpurea Link. PURPLE CLIFF-BRAKE. Rare or occasional on dry exposed ledges of either limestone or trap.

Cryptogramma acrostichoides R. Br. SLENDER CLIFF-BRAKE. Very rare and of recent discovery in the state, growing on moist shaded ledges of calcareous rock. Kent (Eames and Austin) Salisbury (Mrs. Charles S. Phelps). It is also reported from New Haven.

Woodwardia virginica J. E. Smith. CHAIN-FERN. Wet swamps often in sphagnum. Plentiful at some stations, but rather local in its distribution.

Woodwardia areolata Moore. CHAIN-FERN. Occasional in wet or swampy woods near the coast, becoming rare or absent inland.

Asplenium pinnatifidum Nutt. One of our rarest ferns. It was found growing on rock ledges at Sharon by Mr. E. I. Huntington (see FERN BULLETIN, XI-14). I have no other report of it from the state.

Asplenium ebenoides R. R. Scott. This rare species, now regarded by many as a hybrid, has been reported from only two stations in the state, both in the town of Canaan. The first collection of it was by Mr. J. S. Adam in 1876. Mr. Adam informs me that the plant flourished there until 1891, but has not been seen since. One plant was found at another station a few years ago by Mr. C. K. Averill.

Asplenium Trichomanes L. MAIDENHAIR SPLEENWORT. On shaded ledges. Rare or occasional near the coast, becoming frequent northward.

Asplenum platyneuron Oakes. EBONY SPLEENWORT.

Frequent in dry rocky ground, more often in half shade, throughout. The form with more deeply cut pinnæ known as var. *serratum* occurs occasionally.

Asplenium montanum Willd. MOUNTAIN SPLEENWORT. Rare. Growing in crevices of dry, usually overhanging ledges. Known from a few widely scattered stations. North Stonington, Scotland, Franklin, East Haddam, Beacon Falls and Salisbury. The last named station, discovered by Mrs. C. S. Phelps, is believed to be the northern limit of its known range.

Asplenium Ruta-muraria L. RUE SPLEENWORT. Occasional on rocks in the limestone district, rare on the trap dykes, not reported elsewhere.

Asplenium angustifolium Michx. NARROW-LEAVED SPLEENWORT. Rare in moist, rich woods, apparently confined to the region of trap dykes. Guilford, Berlin, Meriden, Southington.

Athyrium thelypteroides Michx. SILVERY SPLEENWORT. Moist rich woods occasional throughout.

Athyrium Filix-fœmina Bernh. LADY-FERN. Common in woods, thickets, and along fence-rows in various soils throughout. There are many described forms, most of which seem to be caused by the soil, the exposure or some special habitat.

Camptosorus rhizophyllus Link. WALKING-LEAF. On shaded ledges of limestone, granite, sandstone or basalt. Rare or occasional throughout, becoming frequent in the limestone district.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Common throughout in woods and on shaded banks. Several forms have been described and are occasionally seen.

Nephrodium Thelypteris Desv. MARSH FERN. Common in swamps and wet ground throughout.

Nephrodium simulatum Davenport. MASSACHUSETTS FERN. Rare or local in wet woods and cedar swamps in southern part of the state. Not reported from northern districts.

Nephrodium Noveboracense Desv. NEW YORK FERN. In moist woods, frequent throughout.

Nephrodium marginale Gray. EVERGREEN WOOD-FERN. Common in dry woods in rocky ground throughout.

Nephrodium Goldieanum Hook. Moist rich woods, rare or local. Not reported from eastern part of state.

Nephrodium Boottii Davenport. Occasional throughout in moist or wet woods, usually growing near *N. cristatum.*

Nephrodium cristatum Michx. CRESTED SHIELD-FERN. Frequent in wet woods and shaded swamps throughout.

Nephrodium cristatum var. *Clintonianum* Gilbert. Rare or occasional in wet woods and swamps, often growing with the typical form.

Nephrodium cristatum X marginale. This hybrid form has been collected at Granby (I. Holcomb) Waterford (Dr. C. B. Graves) and at East Lyme (Miss A. M. Ryan).

Nephrodium spinulosum Desv. SPINULOSE WOOD-FERN. Occasional in moist or wet woods throughout.

Nephrodium spinulosum var. *intermedium* Davenport. Occasional or frequent in rich moist woods. Forms approaching var. *dilatatum* Hook. occur: also those seeming to answer to var. *fructuosum* Gilbert.

Cystopteris fragilis Bernh. Frequent on moist shady ledges throughout. One of the earliest ferns to appear in the spring.

Cystopteris bulbifera Bernh. BLADDER-FERN. Common in rich moist woods and meadows and on wet ledges in western districts, becoming rare and extinct eastward.

Woodsia ilvensis R. Br. RUSTY WOODSIA. Rare or occasional on dry exposed ledges.

Woodsia obtusa Torr. Occasional throughout in dry rocky woods or in half shade.

Dicksonia punctilobula Gray. HAY-SCENTED FERN.

Common throughout in woods and pastures both dry and moist, often forming large colonies.

Onoclea sensibilis L. SENSITIVE FERN. Common Throughout in low fields and in swamps. The form with the same frond, part sterile and part fertile, called var. *obtusilobata* sometimes occurs.

Onoclea Struthiopteris Hoffm. OSTRICH-FERN. Frequent in alluvial soil along the Connecticut and Housatonic rivers and their larger tributaries; rare elsewhere.

SCHIZÆACEÆ.

Lygodium palmatum Swartz. HARTFORD FERN; CLIMBING FERN. Occasional or rather local in moist thickets and open woods, usually in sandy soil.

OSMUNDACEÆ.

Osmunda regalis L. FLOWERING FERN. Frequent throughout in low thickets, wet pastures and meadows and along streams.

Osmunda Claytoniana L. INTERRUPTED FERN. In old pastures, along fence-rows and in open woodlands, frequent throughout.

Osmunda cinnamomea L. CINNAMON FERN. Common in wet thickets and swamps and in boggy ground. A form occurs with the pinnæ of the sterile fronds more or less cut, called var. *incisa*.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. ADDER'S-TONGUE. Moist meadows and old pastures throughout. Considered rare, but probably more frequent than usually supposed, as the plant is very inconspicuous in the field.

Botrychium simplex Hitchcock. SMALL GRAPE-FERN. Rarely reported. It grows in moist woods in leaf mould sometimes with *B. matricariæfolium* and *B. lanceolatum.* The plant listed in the Berzelius Catalogue as *B. Lunaria* evidently belongs here, and probably also collections from the state reported as *B. tenebrosum* A. A. Eaton. Small forms of *B. matricariæfolium* are sometimes difficult to separate from this.

Botrychium matricariæfolium Braun. Rare or local but reported from a number of widely scattered stations. Growing in rich leaf mould as does the following species. So far as observed its spores are matured at an earlier date than those of *B. lanceolatum.*

Botrychium lanceolatum Angs. Rare, but widely distributed, often growing with or near *B. matricariæfolium.*

Botrychium obliquum Muhl. GRAPE-FERN. Widely distributed and frequent in moist meadows and pastures, or sometimes in dry sandy soil. This passes by a variety of intergrading forms into the following:

Botrychium obliquum var. *dissectum* Clute. Occasionally seen in its extreme form with finely dissected pinnæ when it is very distinct from the type in appearance.

Botrychium ternatum var. *intermedium* D. C. Eaton. Occasional in rich woods throughout. Sometimes large when it is called var. *australe* and in shaded places with a small and thinner frond approaches var. *Oneidense.*

Botrychium virginiaum L. RATTLESNAKE FERN. In rich woods frequent throughout. Sometimes seen with two fertile sections to the frond.

MARSILIACEÆ.

Marsilia quadrifolia L. Plentiful in Bantam Lake, Litchfield, its only native habitat in this region, though it has been introduced at other stations.

LYCOPODIACEÆ.

Lycopodium Selago L. FIR CLUB-MOSS. Known only from cool shaded ravine, New Haven (J. A. Allen, 1879). Has been collected at Mt. Holyoke, Massachusetts, and should occur at intermediate stations along our trap dykes.

Lycopodium lucidulum Michx. SHINING CLUB-MOSS. Frequent throughout in cool damp woods.

Lycopodium inundatum L. BOG CLUB-MOSS. Rare or local in open bogs usually in sandy soil throughout. The larger form called var. *Bigelovii* Tuckerm. is apparently confined to the vicinity of the seashore.

Lycopodium annotinum L. STIFF CLUB-MOSS. In wet woods, rare or local, confined to the northwestern part of the state.

Lycopodium clavatum L. GROUND-PINE. Occasional in woods and thickets, more often in dry sandy soil throughout. Does not often fruit here.

Lycopodium clavatum var. *monostachyon* G. and H. This variety with more appressed leaves and only one larger fruiting strobile on a stalk occurs locally and seems to fruit freely.

Lycopodium obscurum L. TREE CLUB-MOSS. Frequent in woods and pastures, either dry or moist throughout. Most of our plants are of the form called var. *dendroideum* D. C. Eaton, having all the leaves alike.

Lycopodium complanatum L. var. *flabelliforme* Fernald. GROUND-PINE. Common in dry woods and pastures throughout.

Lycopodium tristachyum Pursh. Occasional in dry woods throughout. Fruits several weeks earlier than the previous species.

SELAGINALLACEÆ.

Selaginella rupestris Spreng. Occasional on dry ledges throughout.

Selaginella apus Spreng. In moist meadows, common.

EQUISETACEÆ.

Equisetum arvense L. HORSETAIL. In sandy soil, both dry and moist, common throughout.

Equisetum pratense Ehrh. Known only from moist sandy alluvium on the banks of the Housatonic River. Oxford (Dr. E. H. Eames and E. B. Harger) Newtown (E. B. Harger).

Equisetum palustre L. Local in wet alluvial along the Connecticut River. Lyme (Dr. C. B. Graves) East Windsor (C. H. Bissell). Both this and the preceding species seem to have been overlooked and should be found elsewhere.

Equisetum sylvaticum L. WOOD HORSETAIL. Rare or local, in wet ground about springs or in moist places throughout.

Equisetum fluviatile L. WATER HORSETAIL. Occasional or local in wet meadows or in shallow water. Very plentiful at some stations.

Equisetum hiemale L. SCOURING-RUSH. Frequent in either moist or dry, usually sandy soil throughout. Many forms of this have been described. The variety *affine,* and variety *intermedium* both occur.

Equisetum variegatum Schl. Rare in alluvial soil at a few stations. Canaan (Dr. Robbins, Dr. A. W. Evans), Cornwall (C. H. Bissell), Hartford (H. S. Clark). Our plant seems to be the form called var. *Jesupi.*

Equisetum scirpoides Michx. DWARF SCOURING-RUSH. Rare or local in rich moist woods confined to the northwestern part of the state.

ISOETACEÆ.

Isoetes Tuckermanni A. Br. Occasional, growing submerged on gravelly shores of ponds.

Isoetes foveolata A. A. Eaton. Known at present only from a collection made from a pond in Meriden by F. W. Hall in 1873.

Isoetes saccharata Engelm. var. *Amesii* A. A. Eaton. Rare in shallow water of ponds and rivers; Griswold (E. B. Harger), Ledyard (C. B. Graves), North Stonington (Graves and Bissell).

Isoetes echinospora Durien. var. *Braunii* Engelm. In shallow water, muddy borders of ponds and streams, frequent throughout.

Isoetes echinospora Durien. var. *muricata* Engelm. This form with longer, very slender leaves is reported from a few stations.

Isoetes Gravesii A. A. Eaton. Occasional or local on muddy border of ponds and slow streams. Widely distributed and plentiful at certain stations.

Isoetes Engelmanni A. Br. Occasional throughout on muddy border of ponds and streams where it would be submerged during high water. The slender form called var. *gracilis* is sometimes seen.

Isoetes Canadensis Engelm. In shallow water of streams. Rare. Westport, Fairfield (Dr. E. H. Eames.)

A few comments on the preceding list may be of interest.

Three of the ferns listed, *Cheilanthes lanosa, Asplenium pinnatifidum, Asplenium montanum,* are not known elsewhere in New England, and our Connecticut stations are supposed to be the northern limit of their range. One of the fern allies, *Marsilia quadrifolia,* has not been collected as a native plant anywhere in the United States except at the Bantam Lake station. I do not know that anyone has ever claimed for Connecticut an extremely large fern flora, but investigation shows that our list will bear comparison with that of almost any other state.

Mr. Eggleston in his Fern Flora of Vermont states that Vermont has a surprisingly large number of ferns for its area. Vermont is not a large state, but it covers practically twice as much surface as Connecticut. Figuring both lists on the same basis of species and varieties of the ferns proper, the Vermont list has nine species lacking in our list, while we have seven not on the Vermont list. Of the fern allies, Vermont has six not on our list, and we have eight not on theirs. That is, we have two species less of the ferns proper and two more species of the fern allies.

Our total number is the same as theirs with only about half the area to collect from. If the Vermont list is surprising, what shall we say for Connecticut? Of the varieties omitted *Nephrodium spinulosum* var. *dilatatum* should probaby have been included, but as authorities disagreed in regard to our material it seemed better to err on the safe side and leave it out. Other species that might be looked for are *Asplenium Bradleyi* in the western part of the state, and *Schizæa pusilla* in sandy ground along the shore; some species can probably be added also in the genus *Isoetes*.

BOTRYCHIUM MATRICARIÆFOLIUM A. Br

An Enquiry into the Relationships between Botrychium Neglectum Wood, Botrychium Matricariæfolium A. Braun, and Botrychium Ramosum Ascherson.

By George E. Davenport.

The subject of this note involves two propositions. The first relating to the identity of American and European plants, and the second to the identity of *Botrychium ramosum* and *B. Matricariæfolium,* and the question of priority of names. In regard to the first there has been not the shadow of a doubt in my own mind, and I am very glad that Mr. Gilbert has received an object lesson from abroad that has convinced him that the two are identical. (See Fern Bulletin for July, 1905.) In support of this position I offer here some comparative figures from specimens selected, out of many, from an extensive geographical range that will, I believe, convince the most skeptical of its truth. (See frontispiece.) Now, I do not mean to assert, even with this convincing evidence of their positive specific identity, that there are no differences between American and European plants, because precisely the same differences are to be found between them as exist in any given series of either of them—that is to say, differences may be found between different individuals of any series of European plants, and similar differences may be found between the individual specimens of any American series, so that differences between the two series are to be expected—but the differences that do exist are merely individual and superficial, such as are common to all species, especially in the *Botrychia,* where scarcely two plants are ever exactly alike. Nevertheless, in spite of geographical separation and range, specimen plants of equal age and development from similar environments are to be found plentifully enough to corespond perfectly in their fundamental, and even in their external general characters.

We cannot expect to find in nature exact agreement among plants, such as we look for in the physical world where patterns are struck off by dies so that each individual is an exact counterpart of the other, but only such agreements and differences as differentiate naturally through the untrammeled operation of the forces of nature, and no intelligent naturalist will ever become so thoroughly imbued with the teachings of the schools as to lose sight altogether of this great truth. One of the unwritten laws of nature is that of Diversity—call it evolution if you will, for it is evolutionary in its character—but it is that which gives to all living forms their individuality, their agreements and divergences, by which we are enabled to classify them within appreciable limits for purposes of study. This classification and arrangement of forms into such groups as exhibit close relationships, artificial as it unquestionably is, appears to be necessary for a complete understanding of the constantly varying whole. But the broader and more elastic the sections into which any system is divided are made, the greater latitude given to the subordinate divisions, and the more flexible species and varieties are, the nearer we get to a natural arrangement of the complex forms that are to be found everywhere in nature.

Holding such views as these, I look upon some of the recent extreme segregations which narrow species down to very nearly individual limitations, as contrary to nature, and as tending to complicate rather than to facilitate the work of general students. Applying these principles to the American and European forms of the species under consideration, the bond of unity between them is strengthened, and becomes more absolute. On the other hand subjecting our American forms to the same treatment that the forms—mere forms, too—of *B. ternatum* have received, would result in the formulating of many false species, and an equally deplorable result would follow such segregation of European forms; yet they both can furnish fully as much material for the manufacture of new species! as *B. ternatum* itself.

At the time Wood published his *Botrychium neglectum* the species was scarcely known to American botanists, and most of the few specimens that had been collected were sadly confused with *B. simplex*— just as similar specimens abroad had been confused with *B. Lunaria*— as I demonstrated in my monograph on *B. simplex* in 1877, so that it was only natural for Wood to suppose that his plant was new, and to name it accordingly; but when its identity with *B. matricariæfolium* became known, Wood's name necessarily lapsed, and the attempt to restore it should be abandoned, as it cannot be successfully maintained.

Our American plant is true *Botrychium matricariæfolium* Al. Braün, and Wood's *B. neglectum* exactly represents Milde's var. *subintegrum*. Dr. Milde himself recognized the identity of American forms with his when he cited for it Hooker's figure of a plant from Canada, in "Icones Filicum" (tab. 82, left hand figure). But in further confirmation of this, I have appended a copy of Luersen's illustrations of European *matricariæfolium* from his "Die Farnplanzen," 1889 (Plate 2). Those figures which represent Milde's *var. subintegrum* correspond very well indeed with Wood's *B. neglectum*.

Milde's *var. compositum* and *var. palniata* have both been found in this country, the first having been collected in Rhode Island by Collins and Chamberlain, and in Vermont by Miss Slosson, and the second in Colorado by Suksdorf. Specimens of Milde's "monstrosities" *Lusus furcatus*, and other forms, have been collected in the North Woods, New York State, by Mrs. Charles Barnes, in the Rangely section of Maine by Miss Furbish, on Mt. Tobey, Mass., by Mr. Fuller, and elsewhere by others. In fact there does not seem to be any possible form of this wonderfully variable species that has not been found, or is likely to be found, in this country.

Now, in regard to the identity of *B. ramosum* Ascherson, and *B. matricariæfolium* A. Br., the real question here is on the identity of the latter with *Osmunda ramosa* Roth, since Ascherson's combination rests on the assumption that the two are identical. So that, while it may be true that *B. ramosum* Ascherson, is identical with *B. matricariæfolium* Braun, if it is not identical with Roth's *Osmunda ramosa*, on which it was founded, the name can have no legitimate standing, and whether *B. matricariæfolium* A. Br., equals *B. ramosum* Ascherson, or not, is immaterial if *B. ramosum* Ascherson does not equal *Osmunda ramosa* Roth, on which it rests.

Our enquiry, therefore, is the more important at the present time, because if *B. matricariæfolium* and *Osmunda ramosa*—this being the real question at issue—are identical, then, under the new conditions created by the Vienna Congress—which has so happily presented to the botanical world such an admirable basis for universal agreement—Ascherson's combination would prevail.

Those of us who have heretofore upheld the first correct combination under a genus as the proper name of a species, may regret the necessity for its abandonment, but we are the more willing to acquiesce in the adoption of the first legitimate specific name since the nomenclatorial section of the Vienna Congress so overwhelmingly rejected its use where its adoption would lead to such

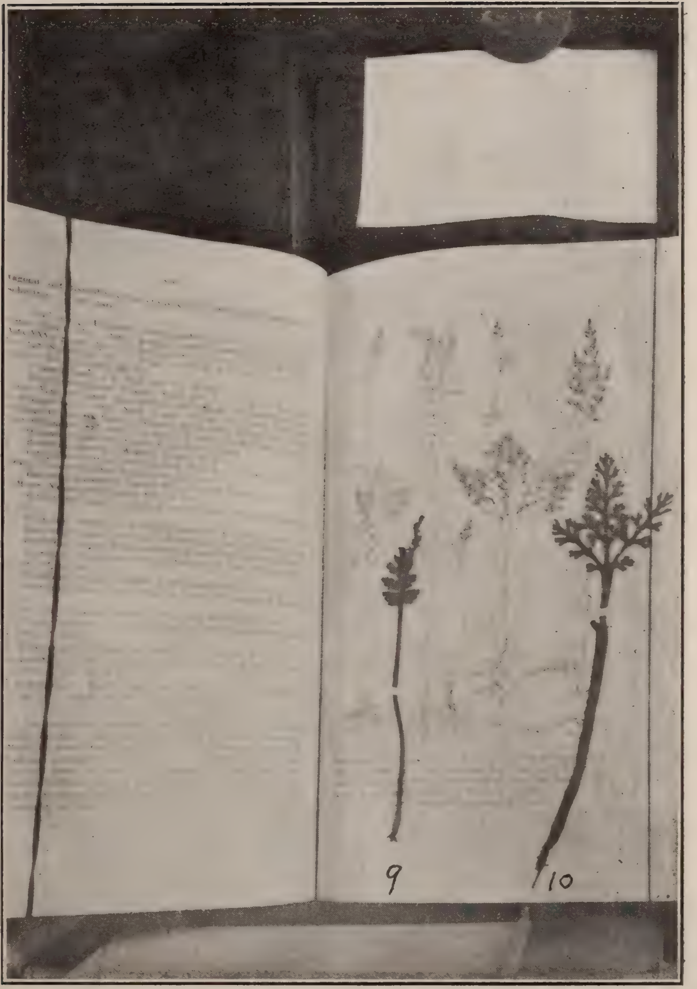

PLATE II

FORMS OF BOTRYCHIUM MATRICARIÆFOLIUM

double naming as *Phegopteris Phegopteris* and similar abominations. I should therefore most cheerfully adopt Ascherson's combination if it could be shown beyond question that it is the oldest name for our plant. Let us therefore review briefly its historical standing:

It is true that Ascherson's *B. ramosum* is generally considered identical with *B. matricariæfolium,* and it has been so regarded by Milde, Luersen, and others. but neither Milde nor Luersen cite *Osmunda ramosa* Roth as a synonym, although the latter cites *O. ramosa* of Lamarck and Borckhausen, but questions their identity with our plant. Ascherson himself established his *B. ramosum* on Roth's *Osmunda ramosa,* and published his combination in the Flora of Brandenburg in 1864.

Now it so happens that, according to Milde, Roth's *Osmunda ramosa,* which was published in "Flora Germanica" in 1788, was founded on a form of *Osmunda Lunaria,* and that in a later edition of the same work, published in 1800, Roth himself referred his plant to *Osmunda Lunaria* (L.) as *var. ramosa,* citing for it three synonyms which Milde declared were referrable "to a plant which at best is a monstrosity of *B. Lunaria,* if, indeed, it is not to be regarded as a product of Art!"

The name *ramosa* itself appeared in 1737 as a citation from Tournefort's Institutes in "Hortus Cliffordianus," where Linnæus described two varieties, "*Lunaria racemosa ramosa major,*" and "*Lunaria racemosa minor adianthifolio*" Breyn. The first of these, according to Milde, belonged to a monstrosity of *B. Lunaria,* and the second is *var. incisum* of the same species. This last I have personally verified, and it is accurately borne out by the fine figure in Breyn's "Plantar Centuriæ."

This may be made still more clear by the following extract from Milde's monograph on *B. Lunaria:* "In the 'Hortus Cliffordianus,' 1737, Linnæus distinguished two *Botrychiums, B. Lunaria* and *B. ternatum.* The former appears on p. 472 as '*Osmunda* with pinnatifid, cauline frond, pinnæ lunulate. H. Lapp. 389,' with two vars.

'a *Osmunda foliis lunatis ramosa,* Tourn. Inst. 547.'" As the synonyms show, the monstrous form of *B. Lunaria* is here meant (*Lunaria racemosa ramosa major* Bauh. Pin. 355).

In further confirmation of the identity of *Osmunda ramosa* and *Osmunda Lunaria,* Hoffman, in "Deutschlands Flora," 1795, cites Bolton's figure in "Filices Britannicæ" (t. 21), that being good *B. Lunaria. O. ramosa* and *Lunaria* appear as synonyms also in "Flora Danica" (t. 18), where it is well figured.

But it is needless to pursue this enquiry any further. The evidence is by no means exhausted, but enough has been brought forward to show that Ascherson's *B. ramosum* does not equal Roth's *O. ramosa,* and that it cannot therefore displace Braun's *B. matricariæfolium,* established by Braun in Doell's "Rheinische Flora," p. 24, 1843. We may then continue to write *Botrychium matricariæfolium* A. Braun, with perfect fealty to the principles of the Vienna Congress.

Finally, the following genesis of the species, with an explanation of the figures, is appended for convenient reference:

In tracing the early history of *B. matricariæfolium,* we find it to be pre-Linnæan, going back to 1677, when it was described and figured by Jacob Breyn in his "Plantar Icones Centuriæ Primæ."

Tablet 93, in the same work, gives an admirable figure of *B. Lunaria,* v. *incisum,* as I have before attested, but I mention it again here to show that Breyn recognized the distinctiveness of the two plants and kept them apart.

In 1755, Linnæus placed Breyn's "*Lunaria racemosa minor matricariæfolio*" under his *Osmunda Lunaria,* in "Flora Sueciccæ," Ed. ii., where it appears as a variety, but without any more definite designation than that of Breyn's.

It should be observed here that Roth did not at any time cite this plant for his *O. ramosa,* while on the other hand he did cite the "*Lunaria racemosa ramosa major*" of Bauhini (Pin. 305), which, as we have seen, belonged to *B. Lunaria,* and here undoubtedly is the starting point for *B. ramosum* Ascherson. To claim anything to the contrary is to decide against the evidence, and it is difficult to see how that name can have any claim upon our consideration, even if it was intended for *B. matricariæfolium,* since the name *ramosa* was preoccupied by another plant and our own plant had already been properly named by Braun.

The next appearance of our plant in anything like definite form was in 1809, when Schkur published it in his Grypt. Gen. tab. 55. fig. b. as *Botrychium rutaceum,* and this was the first time that it had received a distinctly specific designation. The name *rutaceum,* however, was already in use by Swartz (1800) for a form of *B. ternatum,* and so had no standing. Nevertheless, in 1810 Willdenow, and in 1814 Fries, published our plant under *rutaceum,* and the latter in 1828 reduced it to the rank of a variety of *B. Lunaria,* as *var. rutaceum.* In 1836 it was again restored to specific rank as *B. rutaceum* (Kirschleg. Prodr. p. 214), and in 1843 received from Braun its present name.

EXPLANATION OF PLATES.

PLATE 1. Figures 1 to 8 comprise a series of American and European specimens arranged for comparison; 1 and 3 were sent to me by Dr. Christ, and are from the collections of Dr. Hakansson; 4 and 7 were sent to me from Berlin by Dr. Greenman; 2 is from Dorset, Vt., from Mrs. Terry; 5 and 6 are from Rhode Island, Collins and Chamberlain; and 8 is from Conway, Mass., collected by Jesup. Compare especially 4 with 5, and 3 with 6. The difference in the development of the fertile panicles is, of course, wholly due to the different ages of the specimens. Figures 9 and 10 (Plate 2) are photographed on Luersen's fine figures for comparison. Figure 9, which was collected in Conway, Mass., by Jesup, corresponds with Luersen's figures b, c, and d, which represent Milde's *var. subintegrum,* and figure 10, collected in Rhode Island by Collins and Chamberlain, is practically the same as Luersen's figure g. This specimen was collected in May (30th), before the sporophyll—which is seen just emerging from the common stalk below the lamina—had developed; but the lamina agrees perfectly with Milde's description of his var. *compositum.*

PLATE 2 is an exact photographic reproduction of Luersen's page, and the specimens are, of course, all European, but they clearly show the absolute specific identity of European plants with our own. Furthermore, an examination of figures 4 and 5 in Dr. Underwood's "Index to the Described Species of *Botrychium,*" 1903, will show that while those figures faithfully represent Wood's *B. neglectum,* they none the less correspond very well with these European figures of Luersen.

In conclusion, a summing up of the results of our enquiry shows, first, that so far as the question of identity is concerned, the evidence overwhelmingly sustains my contention; as well deny the identity of American and European *B. simplex*—which everyone admits—as deny that of *B. matricariæfolium.* As for its nomenclature, historical testimony could not seemingly be stronger than that which we have reviewed, and which shows conclusively that *Osmunda ramosa* Roth equals *Botrychium Lunaria* (L.). *Botrychium matricariæfolium* A. Br., therefore remains undisturbed.

Medford, Mass., U. S. A., Dec., 1905.

We have received for name from Mrs. Charles H. Beach, Catskill, N. Y., specimens of *Pteris serrulata* from Charleston, S. C. She writes that they were growing from the foundation to the eaves of old houses in the company of *Asplenium ebeneum,* mosses, *Marchantia,* etc. It was common on old houses near the wharves.

SPORANGIAL TRICHOMES.

By E. J. Durand.

Several years ago while examining some sporangia of *Dryopteris thelypteris,* my attention was attracted to certain trichomic outgrowths on the lateral walls near the annulus. These took the form of rather stout glandular or capitate hairs about equal in length to the diameter of the sporangium. While some sporangia possessed several hairs, others might be entirely free from them.

The presence of trichomes in such a position seemed rather odd, so that the literature was examined to learn whether the occurrence of such structures had been recorded. The only reference to anything at all comparable that I could find was the classical figure, reproduced in nearly all the text-books, of the branch arising from the stalk of the sporangium of *Dryopteris filix-mas,* and which was regarded as a paraphysis, or perhaps an aborted sporangium. The structure was, however. quite different from the trichomes mentioned. About the same time similar hairs were noticed on the sporangia of greenhouse varieties of *Hypolepis repens* and *Nephrolepis exaltata,* which led me to believe that their presence was not accidental, as I had previously suspected, but that they might occur regularly in certain species.

The interest thus aroused led me to examine herbarium specimens, in order to see how frequent the occurrence of such hairs might be. About two hundred species, both native and exotic, were looked over. Of these. fifteen were found to possess sporangial trichomes. Eight have only capitate hairs. viz.: *Dryopteris thelypteris, Polypodium crassifolium* (Cuba), *P. pectinatum* (Cuba), *P. tenuifolium* (Cuba), *P. taxifolium* (Brazil), *Phegopteris crinalis* (Hawaii), besides the greenhouse plants of *Hypolepis* and *Nephrolepis* mentioned above. In every case similar glandular hairs were also present on the surface of the frond. Acute hairs occur in *Phegopteris appendiculatus* (India), *Polypodium heteromorphum*

(Ecuador), *P. crenatum* (Cuba), and *P. urophyllum* (Penang). In the last named species the sporangium fairly bristles with spine-like hairs which give them quite a formidable appearance. In these species also similar hairs occur on the frond. Our own *Phegopteris polypodioides* and *P. hexagonoptera* possess both glandular and acute hairs on both sporangia and frond, the acute ones being as long as the sporangium. *Polypodium Hookeri* (Hawaii) is peculiar in having its frond clothed with stiff dark brown hairs, which also occur several on each sporangium. They are long and tapering and several times the length of the sporangium.

It is of interest to note that trichomic outgrowths occur also on the heads of the paraphyses which are found among the sporangia in the sorus of *Polypodium vulgare*.

Briefly summarized, these observations indicate that outgrowths strictly trichomic in their nature occur on the sporangia of certain ferns, arising from the lateral walls near the annulus; that sporangial trichomes occur only in such ferns as have similar trichomes on the surface of the frond. Such an occurrence is perfectly consistent with the known epidermal origin of fern sporangia. If it is desired to find a use for all such structures. it is suggested that the trichomes may be protective, since they exist most commonly in non-indusiate species.

I might also say that while examining a student's preparation of developing sporangia in *Pteris cretica* recently, I noticed a branch from the stalk of one which appeared in all respects similar to the figure mentioned above of *Dryopteris filix-mas*. It bore every appearance of being an aborted sporangium which had started to develop from the stalk of an older one.

Botanical Laboratory, Cornell University.

Mr. E. J. Winslow sends us a frond of *Woodsia hyperborea* that measures more than eight inches in length. This is rather above the maximum measurements given for this plant.

TROPICAL FERNS IN SOUTHERN STATES.

By Willard N. Clute.

The fern study of the Southern States has one fascinating element about it that those who have confined their collecting to regions further north can know little about. When a northern collector goes after ferns he knows pretty much what to expect. On the rocks he counts upon finding the polypody, the bladder ferns, the woodsias, and some of the smaller spleenworts; in the woods, the larger spleenworts, the wood or shield ferns, and the grape ferns; in the swamps, the osmundas, the sensitive fern, and the ostrich fern; along the highways and in the field, the bracken, the dicksonia, and a sprinkling of the hardier species of wood and swamp. If fortune is kind to him he may chance upon the walking fern or the cliff brakes among the rocks, or the woodwardias in the swamps, but in any event his rarities are species known to grow in the general region. and zest is given to his excursions, not by the hope of finding something new. but by the hope of finding some rare species that, according to all the indications of the soil, shade, and moisture, should be found there.

With the southern collector the case is different. He is confined to no previously cut and dried list of species, but may continue to ramble among familiar scenes warranted in the expectation of being a discoverer of unrecorded species. The reason for this is two-fold. First of all, the country has not been as thoroughly explored by the botanist as have the Northern States. and in addition, the explorations. due to the peculiarities of growth and habitat assumed by southern ferns, have to be conducted in a different way. At the north, where the struggle for existence is not the most strenuous, the plants of a single species may form extensive colonies over large areas, so that a single trip of any length may show approximately what the fern flora of a given region contains. As one approaches the equator, however, the competition of species with species for light and air is so fierce that only individuals specially adapted to the habitat can hope to form extensive colonies. Even our cinnamon fern, which inhabits almost every swamp and wet woodland in the north, is reduced to a few acres in a single marsh in Jamaica. In the tropics many ferns are obliged to grow upon other ferns, or on the branches of trees, to find room for existence, fitting themselves into any vacancy as best they can. The behavior of the common gray polypody or resurrection fern, so common on the live oaks about New Orleans, is an illustration of this. In the northern part of its range it grows on the earth or on rocks; hereabouts it is usually an epiphyte.

Thus it happens that while southern ferns are more abundant as to species, and, taken plant for plant, are more abundant as to individuals, a single species rarely becomes conspicuous because of its numbers. It may grow in one restricted spot and not be found again in the same country. In Jamaica the rattlesnake fern is confined to a few acres of woodland, while the representative of the common grape fern, *Botrychium Jenmani,* is found on a single scrubby hillside. One might search the island for years without finding either. Owing to this isolation of species, southern regions must be examined more carefully than others before their species are all catalogued. This doubtless explains Mr. Eaton's recent successful trip to southern Florida, which added half a dozen or more species to the fern list of the United States. The performance might possibly be repeated again with equal success by varying the route a bit.

Again, the Southern States are most advantageously situated for obtaining additional species of ferns from other regions. At least 75 per cent. of Florida's ferns are species whose centers of distribution are in the West Indies or further south. And if we divide the State into the northern and southern half, the percentage of tropical ferns in the southern half rises to more than 90 per cent. Whether these species were derived from the West

Indies while yet the two regions had a land connection, or whether they have since arisen from wind-blown spores, we cannot here stop to discuss, but the fact that new plants may arise in the latter manner appears to be too well substantiated to need additional proof. It has been but a few years since *Pteris longifolia* and *P. serrulata* were discovered in Louisiana in positions that show conclusively that they, at least, have originated from wind-blown spores. The floating fern also has but recently been reported from the State, but in the latter case it is possible that currents of water instead of currents of wind wafted it to these shores.

The question may then be asked, are we to conclude that these species are the only ones capable of making the journey from Florida or the West Indies? I think no botanist would be inclined to say that they are. In the West Indies are upwards of five hundred species of ferns annually producing millions of spores which are floated away on winds that for much of the year set directly toward the southern United States. The spores are so light and the distance so short that it appears certain that the spores of many tropical species must have fallen again and again within this region. There are good reasons why they should not all germinate, or germinated, why they should not come to maturity, but that any of them at any time may accomplish both ends is quite within the bounds of possibility. Quite recently, single plants of *Hypolepis repens* and *Asplenium auritum* have been reported from Florida, which seems to make our possibility into a probability.

This, then, gives the fern collector reason to expect many species yet unrecorded from our southern boundaries. If *Meniscium* and *Davallia* and *Taenitis* can live in Florida, why not their companion plants in tropical islands? Two new filmy ferns have recently been added to the Florida list. Who knows how many other species are thriving on the trunks of trees in the everglades as yet unseen by man? It is not enough that they do not grow on the trees thus far examined. In their native haunts they do not grow on every tree nor in large areas. In fact, one Jamaica species. *Trichomanes trichoideum,* seems to be found only on the trunks of a certain kind of tree fern—*Cyathea pubescens*—in that island. And if *Pteris longifolia* can thrive in Louisiana, why should it not also grow in Alabama and Mississippi? Why, too, should not the species that have the same general habitat be found with it? If *Nephrodium patens* is common, why not expect *N. molle,* which is so much like it? It is not entirely a matter of climate, as some may be inclined to think. Climate may be granted as a most important factor, but it may sometimes be over-estimated. The Florida crest fern, which grows naturally nowhere except near the Gulf, has proven hardy in northern Illinois, and *Nephrodium patens* in New York and Vermont.

Doubtless many tropical ferns, especially those with a thick epidermis like the polypody, the grass fern and *Taenitis,* are hardy enough to withstand the southern winters. These grow in Florida, and may yet be reported from the lower delta. So, too, we seem warranted in expecting *Acrostichum aureum* from the coastal swamps. In fact, we seem warranted in expecting a large number of other tropical species. When they will be found, or whether they will be found at all in this region, remains a problem for fern students to solve.

DRYOPTERIS FILIX-MAS IN VERMONT.

By Tracy E. Hazen.

The industrious searching of the large body of fern-lovers within recent years has brought to light a number of forms and sub-species new to systematic botany. To discover, however, a well-known species not before reported in New England, is a matter of great interest. Mr. Eggleston, in his article on the ferns of Vermont in the Fern Bulletin, made the suggestion that *Dryopteris Filix-mas*, among other ferns, might be looked for in the

State. This prediction has been fulfilled by the discovery of this fern in the town of Hartland, in September last, by Miss Nancy Darling. To find this northern form here seems somewhat surprising in view of the fact that the nearest stations previously known were in Gaspé, Quebec and Nova Scotia; but it is evident that northern conditions are present in some degree, for from the same town, which has no great elevation, are reported *Polystichum Braunii*, *Woodsia glabella* and possibly W. *alpina*, though the latter has not been confirmed by specimens submitted to the writer. Specimens of the *Dryopteris Filix-mas* have been deposited by Miss Darling in the herbaria of the University of Vermont and of Columbia University.

New York City.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from this list.

Campbell, D. H. *Affinities of the Genus Equisetum.* Illust. American Naturalist. My. 1905.

Clute, W. N. *Check-list of North American Fernworts.* Fern Bulletin, O. 1905. Notes on previous fern lists and tables of orders, families and genera.

Davenport, G. E. *Reversions and Their Fluctuations.* Fern Bulletin, O. 1905.

Fernald, M. L. *An Alpine Adiantum.* Rhodora, N. 1905. Records a form of *A. pedatum* (var. *Aleuticum* Rupr.) from the far North.

Gilbert, B. D. *Mrs. Taylor's Georgia Ferns.* Fern Bulletin, O. 1905. Notes with description of *Adiantum hispidulum f. strictum.*

Gilbert, B. D. *Observations on North American Pteridophytes—II.* Notes with description of *Dicksonia pilosiuscula f. Nana.*

Hans, A. *Ferns for Everyday Use.* Illust. Horticulture, D. 10, 1904; Ja. 7, 28; Mr. 4, 11; Ap. 15, 22;

My. 6, D. 9, 1905. Cultural notes on the best species of *Adiantum, Asplenium, Cyrtomium, Davallia, Polypodium Polystichum* and *Pteris.*

KELLERMAN, W. A. *The Gray Polypody in Ohio.* Torreya, N. 1905. Records of several stations.

KLUGH, A. B. *Notes on the Ferns of North Central Ontario.* Plant World, D. 1905.

KLUGH, A. B. *Scolopendrium Vulgare in Ontario.* Illust. Fern Bulletin, O. 1905. Distribution, with map.

LYON, F. *The Spore Coats of Selaginella.* Illust. Botanical Gazette, O. 1905. Recounts the formation of spore coats principally in *S. rupestris* and *S. apus.*

LYON, H. L. *A New Genus of Ophioglossaceæ.* Illust. Botanical Gazette, D. 1905. Proposes the genus *Sceptridium* for the ternate *Botrychiums* because of certain peculiarities of the gametophyte or prothallium.

MAXON, W. R. *A New Lycopodium from Guatemala.* Proceedings of the Biological Society of Washington. D. 9, 1905. *Lycopodium dichæoides.*

MAXON, W. R. *A New Fern from Porto Rico.* Proceedings Biological Society of Washington, O. 17, 1905. Substitutes *Polystichum Krugii* for *Aspidium Krugii* of Kuhn.

MAXON, W. R. *A New Name for Kaulfussia Blume, a Genus of Marattiaceous Ferns.* Proceedings Biological Society of Washington, D. 9, 1905. Proposes to substitute *Christensenia* for *Kaulfussia* of Blume.

NICHOLS, G. E. *Selaginella Pusilla in Cape Breton.* Fern Bulletin, O. 1905. Description of a new station.

WOOLSON, G. A. *A Precocious Cystopteris.* Illust. Fern Bulletin, O. 1905. Describes a viviparous frond.

WOOLSON, G. A. *Indoor Ferneries for Winter.* Illust. Garden Magazine Ja. 1906. Directions for using native species.

WOOLSON, G. A. *Rock-loving Ferns in the Garden.* Illust. Garden Magazine, F. 1906. Describes the making and planting of rockeries.

EDITORIAL.

Some shrewd observers are of the opinion that the present system of writing botanical names offers altogether too many inducements to that species of scientist familiarly known as the name-tinker. Suppose we have a species so nicely balanced that it might without great impropriety be placed in either of two genera; or suppose a section of a certain genus is so strongly specialized that its claims to rank as a separate genus may find supporters; if we make it a meritorious act to change the species about, or to elevate the section to the rank of a genus, we may be sure there will be plenty to claim the reward. That the common practice of botanical writers does offer such reward by writing after the new combination, in addition to the name of the one who discovered the species, the name of the man who made the new combination is very clear, and the sooner this prize is withdrawn, the sooner will that long-sought stability in nomenclature appear. Still more abominable than the practice alluded to above, because it omits all mention of the discoverer of the species, is the scheme of crediting the name-juggler with the combination. This has gained considerable favor recently, and we have used it to some extent in this journal, but never expect to do so again. Those who favor this practice assert that the specific name is only part of the name of a species and that not until the correct specific name is joined to the correct generic name is any plant properly named. They would therefore write after the combination only the name of the one who made it. After carefully looking the matter over, however, it has seemed to us that the one who has the first right in the name of a species is the one who discovered it, and we believe that this name, and this name alone, should be attached to the combination. When the species has later been transferred to some other genus, the fact can be indicated by enclosing the author's name in parenthesis. This is the method long in use by ornithologists, and it seems to work satisfactorily. We look to see it adopted soon by all other branches of science. We have adopted it in the new list of species published in this journal, and the same method was used in the editor's "Fern Allies." So accustomed have botanists been, however, to expect an author to claim all species in which the parenthesis is not followed by an author-citation that an official in one of our great herbariums seeing the second citation omitted in the "Fern Allies" wrote to the author to inquire if he meant to claim all those species as his own! This way of indicating the species, on the contrary, removes entirely the excuse for anyone claiming a species he did not discover, and gives no credit to the nomenclaturist for juggling the names about. By its use we may avoid many serious upheavals in the future and ultimately get each species firmly connected with a single scientific name.

⁂

The publication of De Vries' views on the origin of species by mutation is likely to have a rather disquieting effect upon the radical species-maker. De Vries claims that species do not become differentiated gradually, as Darwin taught, but that new species spring full-fledged, as it were, from older ones. By cultivating various plants he has actually been able to see them throw off these new forms. This certain species have done again and again, and he properly concludes that these various forms are all part of one systematic species. To these minor forms he has given the name of elementary species. Some systematic species are known to be made up of immense numbers of these elementary species, the common little whitlow-grass (*Draba verna*) possessing more than two hundred. Although De Vries has only attempted to show the method by which new species and varieties have arisen, we believe the facts he has demonstrated also point to the conclusion that many of what have been recently called species of *Botrychium, Selaginella,* etc., are really in the nature of elementary species. This opinion has long been held by THE FERN BULLETIN, and nearly ten years ago, we suggested editorially that "Botrychium dissectum" is but a form (or elementary species) of the better-known *Botrychium ternatum.* The past decade has been characterized by the inordinate multiplication of species in the ferns and fern allies, but this has now come to a halt for want of further material. Doubtless the coming years will see a disposition to more carefully study these plants in field and garden, to the end that they may be given the rank to which they really are entitled. That we have twenty or more good species in the *Selaginella apus* group in America is simply preposterous. A student who will work out their true relationships is desired.

BOOK NEWS.

Christensen's "Index Filicum" has reached its sixth fascicle. Nearly four hundred pages have thus far been issued.

Since John Robinson's "Ferns in Their Homes and Ours" went out of print there has been real need of a new book on the culture of ferns. This G. H. Woolson has attempted to fill in his little book entitled "Ferns and How to Grow Them."[1] The author is well qualified for the work, having cultivated ferns for many years and had considerable experience in writing of them, but his efforts have been sadly hampered by publishers who evidently do not understand the making of fern-books, notwithstanding their reputation in such matters. In several instances three illustrations have been reproduced on one small page to the ruination of what were evidently fine pictures. There is no uniformity in the text, some specific names being italicised and others not and the capitalization is equally bad. Most deplorable of all is the egotism that prompted a list of "Standard Names," as if gardeners and fern cultivators could be induced to use *Matteuccia, Filix, Pteridium, Phyllitis* and others upon the mere statement of a publishing house. Two other lists are given, one according to Gray and the other according to Britton, but throughout the book the objectional names are used. Although these are called "standard" a large number have been repudiated by botanists. In at least two places we are told that the best authorities now agree that the royal fern of America and Europe are not identical! The eleven chapters in the book treat of how and where ferns can be grown, describe the making of rock-work and wardian cases, directs how and what to plant and where to get specimens, and discusses the cultivation of ferns, both indoors and out. The author's style is clear, direct and practical and the book abounds in hints that only long acquaintance with the growing ferns can develop. It will be welcomed by all growers of these graceful plants.

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[1] Ferns and How to Grow Them by G. A. Woolson. New York: Doubleday, Page & Co., 1905. 12 mo., 150 pp. $1.00 net.

THE AMERICAN FERN SOCIETY.

Formerly Linnæan Fern Chapter.

Mr. Saunders's long absence in California has made the appointment of a new Treasurer necessary. Miss Nellie Mirick, Oneida, N. Y., has been appointed to that office, and all dues should now be sent to her.

The folder of information about the Society is ready for the printer, and will soon be distributed to members. It contains such facts as are likely to interest those who contemplate joining the Society, and will no doubt do much to increase our membership.

At the recent election the following officers were selected for the Society for 1906: President, James H. Ferriss, Joliet, Ill.; Vice-President, D. W. Fellows Portland, Maine; Secretary, Willard N. Clute, Joliet, Ill.; Treasurer, C. F. Saunders, Philadelphia, Pa. A full account of the elections will appear in the Annual Report.

The mailing list of the FERN BULLETIN is made up from the list of members published in the Annual Report of the Society and in order that members receive their copies of the magazine it is important that this list be correct. Your name in that list at present stands as addressed on this copy of the magazine. If not correct, have it changed at once before the New Report is printed.

There has been an unusual number of new members admitted to the Society during the past quarter. Following is the list: Miss M. A. Marshall, Still River, Mass.; Miss Alice W. Card, 205 South Perry street, Johnstown, N. Y.; Miss Bridget M. Rooney, St. Johnsbury, Vt.; Mr. Percy L. Grubb, 713 Capitol street, Harrisburg, Pa.; Mr. Everett O. Brown, Pomfret Center, Conn., and Mr. A. B. Klugh, Guelph, Ontario, Canada. These names will be added to the list in the Annual Report soon to be published.

The Linnæan Fern Chapter changed its name to the American Fern Society just in time to take in chapters of its own. The first of these is the Woodsia Chapter of Muscatine, Iowa. This is an Iowa idea that may well be followed. In many cities there are large numbers of fern students who might profitably form a chapter for an occasional outing for ferns or the reading and discussion of papers about them. Such chapters pay one dollar annually to the Society and receive one copy of the FERN BULLETIN. The members rank as associate members, but their individual names will not appear in the list of members. The chapters have all the rights of individual members and are self-governing. If members in other cities wish to organize such a chapter, the names of all known fern students in the vicinity will be sent by the Secretary upon application.

ABOUT THE FERN BULLETIN

In offering back numbers of *The Fern Bulletin* for sale, we are not attempting to get rid of some surplus stock. We print hundreds of extra copies of each number for the express purpose of supplying new subscribers with the numbers issued before they became acquainted with the magazine. The great demand for these is shown by the fact that the first five volumes are out of print, volume 6 nearly so, and other volumes are becoming scarce. The illustrations and articles in these numbers are not only still of interest, but *they are becoming more valuable with age*. The price of each volume is 75c. except volume 6, which is $1.00. Volume 6 is not sold separately except to complete files of our subscribers.

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"Our Ferns" and American Botanist, one year	2.75
"Fern Allies" and American Botanist, one year	2.75

These works scarcely need description. A folder describing them will be sent, however, upon application.

Willard N. Clute & Co., Binghamton, N. Y.

The Fern Bulletin

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WILLARD N. CLUTE, EDITOR

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(Formerly Linnæan Fern Chapter)

PRESIDENT, JAMES H. FERRISS, JOLIET, ILL.
SECRETARY, WILLARD N. CLUTE, JOLIET, ILL.

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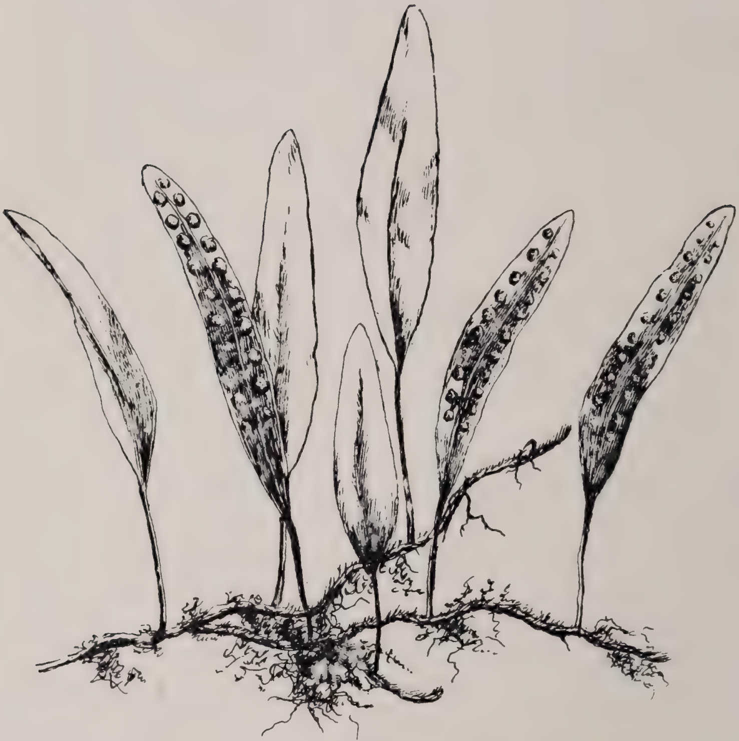

POLYPODIUM PILOSELLOIDES.

THE FERN BULLETIN

Vol. XIV. APRIL, 1906. No 2

LIBRA
NEW Y
BOTANICAL
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POLYPODIUM VULGARE ITS VARIETIES IN AMERICA.

By B. D. Gilbert.

During the last few years I have been collecting material for a monograph on *Polypodium vulgare* and its varieties in this country. I have obtained specimens from Alaska to Maine and southward, showing what influence climate, soil, and other environments will exercise upon even such a stable plant as this. Such a collection was necessary if one were to attempt to give an account that should be anywhere near to a full and inclusive statement of the forms that grow on this continent.

But it was also evident that one must have authorities, and on such a subject authorities are neither plentiful nor very available. Lowe's works contain a few varieties, but although the figures are fine, the names given are not always trustworthy. The work that is most helpful and describes the greatest number of forms is Lindley & Moore's "Nature Printed Ferns." The forms there illustrated are not very many, but there are seventeen varieties named and described, and these cover nearly all the forms known in Great Britain forty years ago.

There was still another source of information more important and necessary than the books in determining the identity of specimens. Nothing can satisfactorily take the place of authoritatively determined specimens of the ferns themselves. This want was kindly supplied by Mr. C. T. Druery of Acton, London, England, and by Dr. H. Christ of Basle, Switzerland, both of whom are acknowledged authorities on ferns. Mr. Druery sent me

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a beautiful set of *P. vulgare* varieties growing in the British Isles, from native plants, not from mere garden varieties. Dr. Christ contributed a fine set of varieties collected in Switzerland, Germany, and Italy. With these in my possession, it has been comparatively easy work to determine the American specimens sent me, and also to decide whether they have ever been named or not. Nearly every year something new has been received, nor has the tale yet been completed, as is evidenced by the new and remarkable form discovered last fall by Miss Church at Lake George, a description of which is included in the accompanying list.

POLYPODIUM VULGARE Linn. is one of the most easily recognized of our ferns. The fronds are usually subcoriaceous, deeply pinnatifid, in some varieties fully pinnate, and even bipinnatifid, 5 to 50 cm. high, 2 to 10 cm. wide, the pinnae faintly serrate to deeply laciniate, the veins branched from once to four or five times, but in one case at least simple, the sori round, medium to large in size, situated generally in the middle of the pinnæ at the end of the lowest anterior branch of the vein, uniserial. It grows preferably on rocks or walls, but sometimes in shaly soil, and ranges as I have indicated from Alaska through Canada to all the Northern States and as far south as Arkansas and North Carolina. Of course in these more southern localities it is only found among the high mountains.

In the FERN BULLETIN for April, 1899, Mrs. E. G. Britton gave a short account of the varieties of *P. vulgare* then known in America, in which she mentioned four that had been found here, viz., *cambricum, cristatum, angustum* and *rotundatum*. Since that time a good many others have been added to the list, and it seems desirable that it should be brought down to the present time, in order that those who are collecting may know what they are liable to find.

Prof. D. C. Eaton in "The Ferns of North America" enumerated ten varieties described by Milde. Of these, the only ones which he seems to imply have been found in this country are *auritum, cambricum* and *cristatum.* Variety *auritum* was given on the authority of Prof. John Robinson, but as I have never seen any American specimens of that variety, and as other forms have been so often mistaken for that, it is not included in my list.

I have arranged the varieties in four groups, as follows:

Group I. With normal fronds.
Group II. With serrate or sinuate or lobed pinnae.
Group III. With branched fronds.
Group IV. With crested fronds.

GROUP I.

1. Var. *angustum* Muell. The peculiarity of this variety is that the pinnæ are long lanceolate, acuminate and often doubly serrate. It includes Maxon's *deceptum,* Millspaugh's *biserratum,* and Gilbert's *acuminatum.* Habitats: West Virginia (Millspaugh, Maxon); Fox' Fall, Herk. Co., N. Y. (Gilbert); Hancock, N. Y. (Mrs. Britton); Shandaken, N. Y. (Mary F. Miller); Onteora, N. Y. (Anna M. Vail).

2. Forma *attenuatum* (Milde). A rather large, slender form, 36 cm. or more long, 8 cm. wide, with many bluntly acute pinnæ, which are alternate. Tip of frond slender, 2 cm. long, slightly sinuated, fruit often extending up into it. Hab.: Lake Sunapee, N. H. (C. E. Waters).

3. Forma *marginale* f. nov. This represents a very regular form of the species, but it is chartaceous rather than coriaceous. Its distinguishing feature is that the fruit dots are marginal instead of central or near to the costa. As the sori are usually situated at the end of the anterior venule in this species, and as that venule extends very nearly to the edge in this form, instead of half way between the edge and costa, it follows that the sori extend in a distinctly marginal row nearly from the midrib of the frond to the ends of the pinnæ. In all the fronds

I have seen, also, the pinnæ are alternate throughout, which means that one pinna stands distinctly alone at the base of the frond. The form was gathered on rocks on a partly cleared hillside, July 8, 1904, at McCall's Ferry, on the Susquehanna River in Pennsylvania, by Dr. C. E. Waters.

4. Forma *platylobum* Christ. This has a short and rather broad frond with unusually broad pinnae, which are rounded at the ends. In our American specimens the pinnæ are sensibly diminished in length at the base of the frond, rendering it ovate in shape; the sinuses between the pinnæ are sharp' thus bringing them close together, and the sori are nearer to the costa than to the edge. The terminal pinna is broad and blunt, very often with three or four pairs of short, almost rotund lobes at its base, and with the sori extending nearly to its apex. The rootstock is uncommonly heavy for the size of the fern. The only North American examples I have seen came from Alaska, and were gathered by J. B. Fleet of Tacoma, Wash., who reports the form as " growing everywhere " in Alaska.

5. Var *rotundatum* Milde. Fronds about 25 cm. long, 3 to 3½ cm. wide, stipe one-half the entire length of the frond, Pinnae alternate throughout, fifteen to sixteen on each side, regularly spaced between and very uniform in length nearly to the tip, very round-ended. This is one of the prettiest varieties of the species on account of the regularity in all its features. Gathered by Dr. C. E. Waters on rocks in dense woods at McCall's Ferry, Susquehanna River, Pennsylvania; Black Hills, South Dakota (Dr. P. A. Rydberg).

GROUP II.

6. Var. *cambricum* (L.) Willd. In this variety the pinnæ are broad and deeply lobed nearly down to their costae, the three or four pairs of lower pinnæ are much contracted at their bases, the lowest pair being quite

free from the rest; fronds 16 to 27 cm. long, 8 to 17 cm. wide, the broadest pinnæ being about 2 cm. wide and cut irregularly in the middle about half way to the costa; pinnæ on the upper half of the frond decurrent and united, ends of pinnæ rather sharply acute. Habitats: Rock City, Dutchess Co., N. Y. (Prof. C. H. Peck); West Goshen, Conn. (Dr. L. M. Underwood); Shandaken, N. Y. (Miss M. F. Miller); Cold Spring, N. Y. (Miss Moncks); Mt. Desert, Me. (Miss E. L. Shaw).

7. Var. *Columbianum* Gilbert. A small fern with coriaceous frond. Whole plant 13 cm. long at most, and 3½ cm. wide; pinnæ numerous, closely placed, blunt or bluntly acute, two lowest pairs often deeply lobed on the lower edge and somewhat on the upper edge also; stipe very short about one-quarter the length of the whole frond; sori round, large, at length confluent and covering nearly the whole under surface of the pinnæ, somewhat immersed and prominent on the upper side; upper surface covered with glands which are sometimes golden and give a golden hue to the fern. Habitats: Arrow Lake, Columbia River, B. C. (A. J. Hill); near O'Kanagan Lake, Rocky Mts., B. C. (B. T. Gilbert).

8. Forma *deltoideum* f. nov. The fronds of this form are strongly deltoid in shape, much the broadest at base and more than half as wide there as they are long. The lowest pair of pinnæ often have an auricle on the *lower* edge at the base. The frond bears only from four to seven pairs of pinnæ, and ends in a lanceolate pinna slightly pinnatifid at base, two to three centimeters long and serrate or sinuate on the edges. Three or four sori on the terminal pinnæ seem to be all the fruit which they bear. Habitat: Rocks at Griffin's Corners, Delaware Co., New York (J. C. Buchheister). Dr. Waters sent me a blue-print of the same form, but without details as to locality. It is one of the easiest forms of all to recognize.

9. Forma *hastatum* f. nov. In a general way this much resembles *deltoideum*. But in two respects it dif-

fers: the lower pinnæ are hastate, with a spur on *each* side at base; and instead of ending in a single long pinna, the frond is pinnatifid to the summit. Nor is it so strongly deltoid in shape. Habitat: Rocks at Griffin's Corners, N. Y. (J. C. Buchheister).

10. Var. *semilacerum* Moore. On the European continent this is ranked as a variety of the sub-species *serratum* Willd., which is a form 35 centimeters long and 16 centimeters wide. In this variety not only are the edges of the pinnæ serrate, but some of the pinnæ are irregularly cut into quite deep lobes. My largest American frond of the variety is 30 centimeters long by 8.5 centimeters wide. Habitat: Rocks, Griffin's Corners, N. Y. (J. C. Buchheister).

11. Var. *sinuatum* Willd. This variety is about the same size as the preceding and much resembles that. The main difference is that the pinnæ are beautifully sinuate or waved on the edges instead of being deeply cut. It is merely a difference of degree, the one being a form of the other, but distinguished from each other by foreign writers. Habitat: Griffin's Corners, N. Y. (J. C. Buchheister): Lake Sunapee, N. H. (C. E. Waters).

GROUP III.

12. Var. *multifidum* Moore. While this variety is about the usual size and outline of *vulgare*, it is very distinct from the species proper in having the rachis forked about 5 centimeters below the summit with two perfectly natural tips to the frond. Both of these tips are liable to be fruited and the sori seem to be confined to them, or occasionally to one or two pinnæ below them. The rhizome with its scales and rootlets is unusually large for the size of the fern. Habitat: Rocks, Griffin's Corners, N. Y. (J. C. Buchheister).

13. Var. *ramosum* Moore. The peculiarity of this form is that one or more of the regular pinnæ is developed into something like a separate frond which is divided

into other regular pinnæ just like the original frond. In other words, a part of the frond is bipinnate. This may occur either in the middle or toward the end of the frond. It is not a forking of the rachis but a branching thereof. Habitat: Rocks, Griffin's Corners, N. Y. (J. C. Buchheister).

GROUP IV.

14. Var. *bifido-multifidum* Druery. This was originally published in America as var. *cristatum* Lowe, and was so given in my List of N. A. Pteridophytes. Nor did I suspect that it was wrong until Mr. Druery's set of English varieties was received. The set included both varieties and it was seen at once that what had been called here *cristatum* was not that variety but was *bifido-multifidum*. The two are entirely different in their characters. They are nearly of the same size and general contour, but the pinnæ of *bifido-multifidum* are like clubs with big knobs on them. The lower edges of the pinnæ are nearly straight. The outer end is enlarged and blunt with a couple of blunt lobes, while the upper edge half way to the mid-rib has one to three more blunt lobes, and the mid-rib at the end of the frond is bifid or flabellate, running out into other lobes. But these terminal lobes are always blunt and bifid. This differs from *cristatum* decidedly, as the ends of the pinnæ in that, although split and somewhat enlarged, lack the big lobes, while the end of the frond is more delicate and graceful. I have seen no American specimens of *cristatum*, and Mrs. Britton's few words in regard to it evidently indicate the variety *multifidum*. Habitat: Rock City, Dutchess county, N. Y. (Chas. A. Coons, also Prof. C. H. Peck).

15. Var. *Churchiæ var. nov.* When this plant was found it contained only two fronds, neither of them fruited, but as nearly alike as two peas. Following is a description of them: Rootstock not seen. Frond 17 centimeter long, stipe 9 centimeters, slender, naked, channeled,

lower part dark, upper part stramineous; rachis 6 centimeters long up to the point where it forks, lamina 5 centimeters wide at base where it is broadest, fully pinnate, the pinnæ rapidly decreasing in length from the middle upward, the 2 centimeters at tip divided and beautifully crested, the rest more or less dentate; seven lower pairs fully separate from each other, the lowest 1 centimeter from the pair above, the four lower pairs rounded at base and *stalked,* those above more and more adnate and decurrent; texture moderately thick, but veins distinct, being more or less sunk in the parenchyma, nearly all but the one or two lowest on such pinnæ being *simple,* the lowest once or twice forked each vein running into a crenature, the outermost flabellate. Fruit not known. There are some peculiar features belonging to this fern. The most remarkable one for a variety of *P. vulgare* is that the four or five lowest pairs of pinnæ are stalked with a pedicel. No other form of the species with which I am acquainted possesses this feature. Without exception all the other forms have adnate pinnæ throughout, except that anomaly in the species called *corymbiense,* and even that has the green part a trifle expanded at the base of the pinnæ. Some forms of var. *cambricum* come near to it in this respect, such as *cambricum* itself and the variety Prestonæ, which is found only in the lake district of England. In the lower pinnæ of these the parenchyma is entirely eliminated from the under side of the veins at the base of the pinnæ, and is very much narrowed on the upper side, so that the pinnæ are fully separated from those above. Still, they are not stalked.

Another peculiar feature is the simple unbranched veins which extend quite to the edge of the pinnæ. This also is an anomaly in the species. The dark shade of the lower part of the stipe and of the upper part of the rachis is another peculiarity. In the fresh plant the costæ of the stalked pinnæ and the rachis above the point where it forks are as dark as in the ebony spleenwort. But when pressed the greater part of this discoloration disappears.

leaving only a light shading of brown. Of course without seeing a sorus, it is a little hazardous to make a positive assertion as to the affiliation of this fern. It can hardly be a cross between two other species, for, so far as I am aware, nothing of that kind is known which takes on a crested form. My opportunities for comparison with other forms are so exceptionally good that I feel safe in allying it with *P. vulgare.* Miss Church, who discovered it, took up the plant and potted it carefully, hoping that it would grow and put forth other fronds which would bear fruit. But it has failed to do so. It may have been like the var. *cambricum* which persistently refuses to produce fruit.

Habitat: On the old wall of Ft. George, Lake George, N. Y. Gathered by Miss Alice Church of New York City, September, 1905. Type of one frond in Gilbert Herbarium.

Clayville, N. Y.

Mrs. Ora Parker Phelps has called attention to the fact that the form of the Christmas fern known as *Polystichum acrostichoides recurvatum* was illustrated in the *Plant World* for April, 1902. The specimens from which this illustration was made were found by Mr. W. R. Maxon, near Falls Church, Virginia. The description accompanying them shows very clearly that they belong to the form *recurvatum* and the illustration removes all doubt. It appears to have been Mr. Maxon's opinion that the fronds were merely odd sports, but there seems to be an inherent tendency in the Christmas fern's constitution to produce such specimens, as is shown by the finding of the same thing in widely separated localities. To Mrs. Phelps is due the credit of recognizing the value of such finds. Although the first record of the collection of this form dates back to 1901, the plant was not named until July, 1904, from specimens collected that year by Mrs. Phelps.

THE RESTING OF BOTROCHIUM.

By Bridget M. Rooney.

Five years ago I began to notice that there were many *sterile* plants, as well as fertile ones among all *Botrychiums,* and on close examination of sterile plants I noticed an abortive, or blasted fertile portion on each stipe, remaining throughout the season. I noticed especially that all the varieties of *Botrychium*, when sterile had this abortive portion on the stipe.

In the hope of getting help from a botanist at some time, I collected some of the stipes possessing this interesting part of the plant which seems to be " resting " and put it in wide-necked bottles, using alcohol as a preservative. Also some " buds " of both fertile and sterile plants. I thought that a botanist could take the stipe out of the bottle and see this blasted portion at any time for study, for I knew that with a good magnifier he could see whether the plant which had been fertile this year, would have a good, healthy fruiting portion in bud for the next season, and since the plant which was sterile, would contain a budded fruiting portion, he could say whether he thought it would continue to " rest " a second season.

After I had completed my collection of stipes and buds, I began to think that we could not be very sure about the abortive portion in bud. I did not feel sure, but that the fruiting portion in the bud might look like a healthy thing and blast after the plant began to develop, or meet with an accident, so I went into the woods this fall to study the points. I took *B. Virginianum* for the study because it matures so early and is very common in our woods, and is so large in the bud that you can see with the naked eye the lamina and fruiting portion. It is very beautiful when you come upon it,—after removing the fallen leaves, and digging down into the earth,—just as green and tender as any little plant would look in the Spring. It comes out as if to get a good start before the frost gets into the ground. On examination of the buds one sees at once that the portion which gave me so much trouble was blasted in the bud. It is not like the healthy fruiting portion either in size, shape, or color. It does not seem to have any chlorophyll in it, and it looks just the same in the bud as it does on the stipe at the end of the season. I think that the number of years for a plant to be fruitful, or to be found sterile, varies. They may be found fruiting one year, and resting another. I examined four buds which I found sterile this season (1905) in late October. Three of them contained healthy fruiting portions, but one of the buds had the blasted or abortive portion and would be found sterile again in 1906. Out of seven fine fertile plants of 1905, three would have been sterile in 1906, the other four showing the green, large, healthy fruiting portions in the buds. The buds which I have are so large, that the opening on the stipe at the base shows quite well. I do not know whether or not one could view the parts of the plant in the buds which I collected and be able to say after using a magnifier what the plant would do two years hence, but a plant which was *fertile* in 1905 and shows a fertile portion in its bud for 1906, might indicate what its condition would be in 1907. I have some fine buds of this year (1905) in a bottle. I used an oil instead of alcohol so as to preserve the color of the abortive portion as well as the beautiful green in the buds. I do not like alcohol as well because it changes the color. The buds are from 1 inch to 1½ inch in length, if not more in large plants. The abortive portion is about 1¼ inch in length, but the normal fruiting portion of the plant is as long as the sterile lamina, and the same color, green, and bent all together.

In 1903, four fertile plants were removed to my little fern garden, they were fertile this year (1905), and I took a plant up this fall to see what would be the condition of the bud, and it showed a fertile portion. *Botrychiums* apparently do not rest alternate years, regularly; they vary. I did not find this abortive portion on the stipe of the little Adders-tongue fern (*Ophioglossum vulgatum*). If it was on the stipe of the plant it was too small to see with my pocket glass. There are, I should say, as many sterile plants as fruited ones where I studied them.

St. Johnsbury, Vt.

THE FORMS OF THE CINNAMON FERN.

By Willard N. Clute.

The forms of the cinnamon fern have never struck me as being important enough to merit much attention, although it seems reasonable that form names should be given to such variations as are fairly constant and distinct enough to be visible. Such variations as have been named *glandulosa* by Mr. Waters, and *incisa* by Mr. Huntington belong, I am sure, to this category. Gray's *frondosa* may also be retained for this peculiar form, although we now know it to be due to some injury to the plant and quite comparable to the *obtusilobata* forms of the sensitive and ostrich ferns.

For some years I have been cognizant of a very distinct form of the cinnamon fern which I had supposed was to be referred to Mr. Huntington's *incisum*, but recently in looking up the description of that fern I find that he says his specimens are *incised*. In my specimens, however, the half dozen pairs of pinnules nearest the rachis in each pinna are regularly and deeply lobed, making such fronds nearly tripinnate and forming an exceedingly graceful plant. It is noticeable that the variation is basal; the deepest lobes are at the base of the pinnules, the deepest lobed pinnules at the base of the pinnæ and the greatest amount of lobing is at the base of the frond. I have seen specimens from both Illinois and Pennsylvania and in each case the plants grew in deep, rich woods where the soil was wet. The form appears to be produced by an abundance of shade and plant food and would no doubt revert to the type in sun or poor soil. I have no specimen of *incisa* for comparison, but if my form is not identical with it, it may, for purposes of description, be called *Osmunda cinnamomea bipinnatifida.*

AN ALABAMA STATION FOR BOTRYCHIUM BITERNATUM.

By W. C. Dukes.

Just west of Mobile, Alabama, there is a gradual rise until, some four miles from the city, one reaches at Spring Hill an elevation of 200 feet or more. In antebellum days this eminence was utilized by Mobilians as a summer resort, and here many of the prominent families of the city built summer-houses, where their descendants still reside. The spacious grounds were planted in cedars and other evergreens; but owing to the changed conditions many of the grounds have been curtailed, and others allowed to grow up to various kinds of second growth. This gives an ideal condition for the growth of Ophioglossaceæ, and here flourish three species of Botrychium, viz.; *B. obliquum* var., *tenuifolium, B. Alabamense,* and *B. biternatum.*

After the first two are well under way, and are flaunting their yellow-tasselled, powder-laden spikes, *B. biternatum* begins to push up its sterile blade, usually towards the last of August or the first of September. At first it seems to grow slowly, but the later rains cause it to develop more rapidly, and by the middle of October to the first of November the sterile frond is well on toward maturity. At this stage the sterile frond lies flat upon the ground, so close in fact that it is in little or no danger from browsing animals.

Even at this date (November 10th) the fruiting frond is formed and lies coiled just at the surface of the ground, dormant, and hidden away from biting frosts in the sedge and grass until the coming of spring.

The whole plant seems to be resting at this stage, and shows no material signs of growth until January or February. At this time the stalk begins to lengthen, and the blade assumes a semi-erect position, but never so much as in the other species. It is now far easier to find than at any other time. The fruiting period generally lasts through March into April, and by the last of April the spores are all shed, and the plant presents a ragged appearance.

Along the edge of fields and pastures, where the ground is kept moist and mellow by a carpet of pine and cedar needles, is the place to find our plant. Occasionally it is found out in the open, but the specimens are smaller, and of a reddish cast. The general outline of the sterile frond is triangular, 2 to 3 inches wide, and 3 to 4 inches long. As the name implies, it is twice-ternate. The sterile frond when at the fruiting stage rises 3 to 5 inches above the ground, and is nearly sessile. Some specimens even branch from the surface of the ground. The outer segments are rounded, decurrent on the secondary rachis, and finely crenulate.

In the early stages of its growth the plant shows a bright clear green, which gradually deepens with age; some plants showing a decided bronze tint, especially those which obtain more sunlight. As in other *Botrychia* the roots are clustered. They are rather more abundant than in most species, although not so large, and branch horizontally two or three inches below the surface, never running as deep as in the taller species.

Mobile, Ala.

THE AUTHOR CITATION.

By Willard N. Clute.

The subject of nomenclature has been pretty well ventilated during the past ten years with the result that the principles upon which plants are juggled from one genus to another are well known even to the novice. As yet, however, we have been unable to shake the cumbersome author citation at the end of every combination of genus and species. The time is not yet when such combinations may appear without author citation of any kind, except in the cases of our most familiar plants, but that the day will some time arrive can scarcely be doubted. If we ever get that "stable nomenclature" so much talked of and so little practiced, there will be no need for appending the name of any authority. Meanwhile it seems to me, we have arrived at a point where we may well dispense with the second of the two author citations.

Two very good illustrations of the evils that may come from retaining both citations have recently come to hand. The first is Christensen's "Index Filicum," in which owing to the arrangement of many species under new generic names, hundreds of new combinations are made. After each of these we find "C. Chr. Ind." and the number of the page upon which the particular name is printed. Does anybody believe that the printing of a mere list of species is sufficient to entitle an author to attach his name to say even one-tenth of the ferns in the world? Is it not perfectly plain that if one can secure immortality in this way, one may easily stretch a point or two to attain it, especially when there are no hard and fast lines for species making among the ferns?

The second instance is found in Lyon's proposed new generic name for the ternate species of *Botrychium*. On account of certain differences in the structure of the gametophyte or prothallium and the behavior of the young sporophyte, the name *Sceptridium* is proposed. At once the familiar names at the end of the *Botrychium* combinations vanish and those who thought they had their hold on the genus *Botrychium* cinched find themselves shut up in parentheses while a Lyon stands guard over two dozen grape fern specific names. This game of tag need not stop here, however. We all know, whether we will admit it or not, that many of the so-called "species" of grape ferns are nothing but varieties, and since *Sceptridium Californicum* (Underw.) Lyon is really *S. ternatum Californicum* (Underw.) and *S. Coulteri* (Underw.) Lyon is *S. ternatum Coulteri* (Underw.). While *S. dissectum* (Spreng.) Lyon is mere *S. ternatum dissectum* (Spreng.) and *S. Jenmani* (Underw.) Lyon is only, *S. ternatum Jenmani* (Underw.) how easy it would be to give these their rightful standing and displace Lyon's name with our own. *Sceptridium tenuifolium* (Underw.) Lyon is almost universally regarded as a mere form—*S. ternatum tenuifolium* (Underw.) and so is *S. Underwoodianum* (Maxon) Lyon, which should be *S. ternatum Underwoodianum* (Maxon). If anyone chooses to cite these and others in the list with a proper show of synonomy and citation of publication he may ultimately be cited in the scientific name of nearly half of them. In no wise would such changes alter our own opinion of the parts they represent and I submit that the addition of the second author citation is both unnecessary and undesirable.

THE DISTRIBUTION OF BOTRYCHIA.

In the first installment of your Check List of the North American Fernworts several species are assigned a habitat which is at variance with my experience and observation. For *Botrychium matricariæfolium* you have, "Rare; in moist shades." I have collected the plant in Maine and Vermont. In Maine I find it locally abundant in sterile fields and pastures; in Vermont occasional in rich woods or hillside pastures. In FERN BULLETIN X. p. 55, Mr. A. A. Eaton writes of having "seen a quarter acre almost completely covered with *B. matricariæfolium* several years in succession." Now, I would venture to guess that the locality referred to was a sandy pasture infested with sweet fern and spreading juniper. Certainly this *Botrychium* is not entitled to be called rare in northern New England. As it grows in dry fields it develops many freakish forms which might easily suggest the name *neglectum*, while in woods it is usually smooth and regular and about twice as tall as the average open field specimen.

I suppose the fact that Mr. Eaton has abandoned his species *B. tenebrosum* and concedes it to be a form of *B. simplex* does not make it necessary that everyone else should adopt the same opinion. But it would interest me to know just your reason for making it a variety of *matricariæfolium.* I have collected it about six times, usually in cedar swamps. *Botrychium simplex* is not "rare" in northern New England. In June of this year I hunted for it about six times in different places about Auburn, Me., and never failed to find it. In ten or a dozen different localities I collected about two hundred specimens, and must have seen several thousand. A little later I was in Vermont and collected it in three different townships. I never collected it in the woods unless my *tenebrosum* is *simplex.* I always find it, if at all, in hillside pastures or sterile fields. In Vermont several ferns grow in open pastures which are generally found in the shade or in the swamps. Such are *Botrychum Virginianum,* and *Osmunda regalis.* Of course it is impossible to give a habitat that will cover every case, but it seems to me that some of the statements in the Check List should be amplified in order to be approximately correct. —*E. J. Winslow, Elmira, N. Y.*

[One of the objects in issuing the Check List was to bring out comments like the above. As to the rarity of this species in question, opinions may differ. The editor has collected more or less for twenty years in six States within the plant's range without seeing it more than twice. Where it was found it grew in great abundance and looking at the single spot one might jump to the conclusion that it is common. Again, this plant is one of those most frequently asked for by exchangers, another indication that it is not always easily found, and probably not common. It would be interesting to hear from others on this subject. Mr. Gilbert writes that he thinks it rather common. The exact reasons for our considering *tenebrosum* a variety of *matricariæfolium* is that in form, place of growth, time of fruiting, etc., it resembles *matriariæfolium* enough to be a form of it. The last time we heard from Mr. Davenport on the subject he also thought as we do. We suspect, though, that Mr. Eaton would hardly subscribe to the statement that he had given up *tenebrosum*. It may be added that comments, criticisms and corrections of the check-list are invited from all. In no other way can we place a correct list before American fern students.—Ed.]

FERN CULTURE.

The raising of ferns from spores is at once the easiest and most convenient method of increase with varieties that adapt themselves to this means of propagation. The selection of spores is necessarily the first step. This, with some of the varieties, requires strict observation and some little experience to catch them just at the proper stage. Though as a general rule ripeness is indicated by the sori turning brown or beginning to shake off. Some of the genera, notably the *Davallias* shed the spores more easily than others and the inexperienced are often apt to delay too long and gather instead of ripe spores fronds with but empty cells.

The fronds when gathered should be wrapped closely in paper and laid in a dry, warm place for a week or two until thoroughly dry, after which the spores can be readily shaken off. The general opinion is that the sooner they are sown after being thoroughly ripened the better, and although not usually necessary to keep them for any length of time, I have sown spores of *Pteris tremula* that had been wrapped up in paper for two years with satisfactory results. Another somewhat difficult matter is to get spores of the individual varieties true or unmixed. Fern spores are of such a light nature that the least breath of air will carry them all over the house, the spores of one variety finding lodgment on the fronds of another. I have sown spores from *Adiantum* fronds and reaped instead of *Adiantums* an excellent crop of *Pteris* where the spores had got mixed in this way; the *Adiantum* spores were there all right, but the *Pteris* spores being the stronger growing and quicker germinating variety it was simply a case of the survival of the fittest. The lesson thus learned is to keep the varieties by themselves and as far away from others as possible for some time previous to the selection of spore fronds.

The next thing is the preparation of the seed-pans. These should be thoroughly cleaned to insure that no germs of moss or fungus are left lodging around. A great deal of what is known as damping off has its origin from this source, being the work of a minute fungus. Fill the pans about one-third full of broken crocks, larger ones in the bottom and those on top finely broken. Over this place a layer of moss, then fill to within an inch and a half of the top with ordinary potting soil. On this place half an inch of soil which has been subjected to a baking process long enough to kill all vegetation in it. This insures against the growth of moss, which in unbaked soil would be more rapid than that of the ferns and prove a source of considerable trouble. This baking of the soil was at one time one of the secrets of fern cultivation, but it is now pretty generally practiced. The surface soil in the pan should be pressed down and made as smooth as possible. A good soaking with water should be given and allowed to drain off before sowing the spores. Sow the spores thinly, I may say very thinly. The spores being very minute, it is an easy matter to sow too thickly without being aware of it. Do not cover the spores, but leave them on the surface of the soil and place over the pan a close fitting pane of glass. The pane must be turned frequently to prevent the moisture from dripping, which would throw the spores into little bunches. Water should never be given from the top, but the pan should be set in a saucer which should always be kept full and from which sufficient moisture will be drawn.

The best place to start spores is in a close atmosphere in a bottom heat of from 60 to 65 degrees. Shade should be provided during the day, but should be removed when the sun is not shining directly on the house. In from ten days to two weeks, depending on the variety, the surface of the pan will assume a green mossy appearance. This is produced by the protalli, which as they become larger will be seen to be small heart-shaped bodies. These in due time produce the sexual organs, the antheridia and archegonia. By sowing two or more varieties in one pan the possibility of the spermatozoids from one variety coming in contact with the archegonium of another may bring about cross fertilization.

The difference in the time needed for the maturing of the sexual organs of the different varieties would need to be studied with the microscope to give a fair chance of bringing about a cross, but this is hardly within the sphere of the ordinary gardener who has to plod along by rule of thumb and take his chance of striking it by accident. No doubt many of the varieties now cultivated have been thus produced.

The crested and variegated forms are mostly the result of sporting, which is the only other means by which new varieties are produced. If the spores have been thinly sown it may not be necessary to transplant until they begin to throw up the little fronds, though they generally require transplanting before that stage is reached. For this shallow flats are the most suitable, a loose sandy compost being provided. They should be lifted in small bunches on a wooden ladle which has been rounded and thinned down on one end for the purpose. The back of the ladle is pressed down into the soil sufficiently to make a little hollow receptacle and when withdrawn from below leaves the little clumps in proper position without having to be touched by hand. Being of a very fragile nature the least touch will bruise them. Some do not believe in watering at this stage, but I make it a practice to sprinkle them lightly after transplanting and find no bad results from it. I always, however, use water at a temperature of about 65 degrees. Covering with glass will be necessary for some time after transplanting, but this should be gradually removed as the little fronds gather strength. Shading must be attended to through all this stage of their growth, as a few minutes sunshine would work irreparable damage. They must also never be allowed to suffer from dryness.

When plants begin to get crowded they should be potted up into thumb pots, using a compost of loam, leaf mold and sand in about equal proportions. The plants need not be singled out individually, but if potted four or five together will make serviceable plants much quicker. For subsequent pottings, which should be given just as soon as the pots they are in are well filled with roots a rather heavier moderately enriched soil should be employed. Raising from spores is by far the most convenient way of keeping up the supply of small ferns, the demand for which seems to be on the increase. The demand for certain classes of plants or flowers is apt to be controlled to a great extent by fad or fashion, but the fern pan, it seems to me, is not going to be lightly thrown aside.

If I were to enumerate all the varieties suitable for the purpose I have no doubt they would fill a good-sized book. But I am sorry to say that the varieties generally met with are not very numerous. I am sure it would pay the growers who would have enterprise enough to keep on procuring and trying varieties different from what are commonly used. They need not be new varieties, for there are hundreds of old ones to pick from, which are worth a trial.

About six months from the time of sowing it is usually required to give useful sized plants a night temperature of about 60 degrees and a day temperature of 75. In stronger heat they could be grown in shorter time, but it does not pay to rush them, as they would not be so compact and bushy, and would of course be much softer. Successional batches should be sown as required, as they soon become too large and if confined for any time in small pots assume a stunted and sickly appearance.

When larger plants are wanted they should be kept moved up, as they need it and receive as little check as possible, and if it is intended to grow them into specimens they should be kept moving just as fast as possible, as the size of the plant does not depend on age or size of crown, as it does upon length of frond. To procure this the chief agencies are intensive culture and quick growth. Most ferns can be materially assisted in this by the application of liquid manures, but this should not be applied unless the pots are pretty well filled with roots, otherwise the residue not used by the plants would have a tendency to clog the soil and cause sourness.

Most ferns adapt themselves to be propagated by division, but this is a slow method with some, and when they come readily from spores need hardly be practiced. Some, however, notably *Nephrolepis,* can be propagated very rapidly by offsets and some, notably *Adiantum Farleyense,* can only be propagated by division of the crown. This latter variety is one of the most beautiful ferns we have, but one that is rather difficult to grow. One of the chief causes of failure with this variety is the lack of heat in winter. It requires a temperature of not less than 65 degrees to keep it growing even slowly.

All ferns require shade to a greater or less extent, but it is a very common mistake to make the shade too heavy. This causes drawn-up, weakly growth, and in a good many cases spoils the individual character of the fronds from lack of proper development. All that is necessary in applying shade is to prevent the strong sunlight from burning or eating the color out of the fronds. Further than to prevent this, shade is unnecessary. Fresh air, also, plays an important part in the health of the frond maintaining the health of the plants.

In conclusion I would like to say a few words in favor of the more general use of hardy ferns for beautifying the surroundings of the home. These adapt themselves to filling corners where few other plants would thrive and we have a great many beautiful native varieties besides a number of foreign varieties that are quite hardy in this latitude. They will grow and thrive in any shady corner as long as they are not under the dense shade and drip of trees.—*From an article by William Scott in Gardening.*

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from this list.

BISSELL, C. H. *Fern Flora of Connecticut.* Fern Bulletin, Jan. 1906.

BRAINERD, E. *Nephrodium Filix-mas in Vermont.* Rhodora, Jan. 1906. The first record for Vermont.

CLUTE, W. N. *Tropical Ferns in the Southern States.* Fern Bulletin, Jan. 1906. Discussion of the species likely to be found in the Gulf States.

DAVENPORT, G. E. *A Hybrid Asplenium new to the Flora of Vermont.* Rhodora, Jan. 1906. A supposed hybrid between *Asplenium trichomanes* and *A. ruta-muraria.*

DAVENPORT, G. E. *Botrychium Matricariæfolium*, illust. Fern Bulletin, Jan. 1906. An enquiry into the relationships between *Botrichium neglectum* Wood, *B. matricariæfolium* A. Br. and *B. ramosum* Ascherson.

DURAND, E. J. *Sporangial Trichomes.* Fern Bulletin, Jan. 1906. Records the occurrence of trichomes on the sporangia of various species.

HAZEN, T. E. *Dryopteris Filix-mas in Vermont.* Fern Bulletin, Jan. 1906.

WEATHERBY, C. A. *An Extreme form of Botrychium Virginianum.* Rhodora, Feb. 1906. A plant with three fertile panicles.

A CHECKLIST OF THE NORTH AMERICAN FERNWORTS.

(*Continued.*)

HYMENOPHYLLACEÆ.

TRICHOMANES L.

23. **Trichomanes Krausii** Hook. and Grev. Rare; on roots and tree-trunks. Southern Florida; also in the West Indies, Mexico and south to Peru and Brazil.

24. **Trichomanes Petersii** A. Gray. Rare; on moist rocks. Confined to a few localities in Alabama, Georgia and Mississippi.

25. **Trichomanes radicans** Sw. KILLARNEY FERN; FILMY FERN. Rare; on moist rocks from Kentucky to Alabama and Florida; also throughout the warmer parts of the world.—*T. Boschianum* Sturm.

26. **Trichomanes sphenoides** Kunze. Very rare; on wet rocks. Southern Florida; also in the West Indies and the mainland of tropical America. This species is sometimes referred to *T. reptans* Sw.

PARKERIACEÆ.

CERATOPTERIS Brong.

27. **Ceratopteris thalictroides** (L.). FLOATING FERN. Rare; floating on the water even where it is brackish. Florida and southern Louisiana; also around the earth in the tropics from Mexico to Brazil and from India to northern Australia.

POLYPODIACEÆ.

ACROSTICHUM L.

28. **Acrostichum aureum** L. Rare; in brackish swamps. Southern Florida; also in Bermuda, the West Indies, Brazil and throughout the East Indies.

29. **Acrostichum lomarioides** Jenm. Rare; in swamps near the coast. Southern Florida; also in Bermuda and the West Indies. Formerly confused with *A. aureum.*

30. **Acrostichum sorbifolium** L. Rare; in moist shades. Southern Florida; also in the West Indies.

ADIANTUM L.

31. **Adiantum capillus-veneris** L. VENUS'-HAIR FERN. Tolerably common; on moist rocks. Virginia to Florida, Utah and California; also about hot springs in Dakota. Found around the world in the tropics and extending to England and Cape Colony.

The form **elongatum** Lemmon is an elongated form from Arizona; forms with round-ended pinnules have been collected in New Orleans.

32. **Adiantum emarginatum** Hook. Not uncommon; in moist shades. California and New Mexico to Oregon.—*A. Jordani* C. Mull.

33. **Adiantum hispidulum** Sw. Naturalized near Thomasville, Georgia. Found also in the East and West Indies.

34. **Adiantum modestum** Underw. Rare. New Mexico. Closely related to *A. capillus-veneris*

35. **Adiantum pedatum** L. COMMON MAIDENHAIR. Common; in moist shades. Nova Scotia and British Columbia to Georgia, Mississippi, Arkansas and Utah; also in eastern Asia.

36. **Adiantum pedatum rangiferinum** Burgess. Not uncommon; in woodlands. Pacific Coast from Oregon north to Alaska. By some this is regarded as a distinct species.

36a. **Adiantum pedatum Aleuticum** Rupr. Not uncommon; in woods. Gaspè Peninsula, Unalaska and the Far North.

37. **Adiantum tenerum** Sw. Not common; on moist calcareous rock. Southern Florida; also in the West Indies and southward to Peru.

38. **Adiantum tricholepis** Fee. Rare; in moist rocky soil. Western Texas and New Mexico.

ASPIDIUM Sw.

39. **Aspidium juglandifolium** Kunze. Rare; in crevices of rocks and in shaded rocky soil. Texas, New Mexico and Arizona.—*Phanerophlebia auriculata* Underw.

40. **Aspidium trifoliatum** Sw. Rare; in moist shades. Florida and Texas; also in the West Indies and southward to Brazil and Peru.—*Tectaria trifoliata* (L.).

ASPLENIUM Sw.

41. **Asplenium angustifolium** Michx. NARROW-LEAVED SPLEENWORT; SWAMP SPLEENWORT. Tolerably common but unevenly distributed; in wet woodlands and open swamps. Southern Canada to Georgia, Tennessee and Missouri.

—. **Asplenium auritum** Sw. Reported from Sumter County, Florida, on the strength of a single frond said to have been collected there in 1894 and now in the herbarium of the New York Botanical Garden.

42. **Asplenium Bradleyi** D. C. Eaton. Rare; on damp shaded rocks. New York to Georgia, Arkansas and Missouri. Specimens described as *A. Andrewsii* Nelson are probably forms of this.

43. **Asplenium cicutarium** Sw. Rare; in moist soil. Florida; also in the West Indies and Mexico south to Peru; in Guinea and Abyssinia.

44. **Asplenium dentatum** L. TOOTHED SPLEENWORT. Rare; in lime "sinks." South Florida; also in the West Indies, Mexico and Guatemala.—*A. trichomanes-dentatum* L.

POLYPODIUM PILOSELLOIDES.

By Willard N. Clute

When we speak of the common polypody we seldom stop to think that this name can be applied to our familiar species in but a comparatively small part of the world. It is true that this species, or forms that closely resemble it, is widely distributed, but in many localities it is anything but common and from others it is absent entirely. So great is the *Polypodium* genus, however, that there is usually a common polypody for every clime though the species may vary with the latitude, longitude or altitude.

One of the common polypodies of the West Indies is the little *Polypodium piloselloides* illustrated herewith. From sea-level to altitudes of a mile or more it is likely to be a familiar feature of the wayside growing on rocks, earth, old logs and living trees. Like our little gray polypody of the South, which inhabits similar situations, it seems to prefer the trunks of trees up which it climbs for long distances by means of its slender cord-like rootstocks. In the forests it often gets well up into the tree-tops. The thick and dark green fronds are usually not as long as one's finger and are entire with an ovate, oblong or lanceolate outline quite unlike the polypodies of northern regions though similar to many allied species in the tropics. They are scattered along the freely branching rootstock on short stipes and at first glance the plant might be mistaken for some flowering vine.

As in many other ferns, the work of spore-bearing has produced a reduction of leaf surface that causes a marked difference between the fertile and sterile fronds. The whole plant is scaly. Upon the fronds are many shield-shaped scales and the rootstock which appears as thick as cord is found to be scarcely heavier than strong thread when the scales that clothe it are removed.

EDITORIAL.

The present issue of this magazine is intended to be on time—at least it was practically all in type by the first of March. At this writing also, part of the July number is in type, and all the principal articles are ready. We have no intention of allowing this magazine to be late again and think we have perfected plans to prevent such occurrences in future. The great trouble has been that the magazine is printed by one of the big printing houses, and just at the time when it ought to be printed, some bigger job crowds it out. We now expect to send copy to the printer somewhat earlier. Contributors will kindly note this and send communications intended for any special number in ample time.

* * *

As usual, the editor expects to spend part of his summer directing the Nature Study work at the Connecticut State Chautauqua. It is too early in the season to present all the details of the courses for this year, but it may be said that a course in the structure of plants will be given which is intended expressly for teachers of nature study and other lovers of outdoors. In these courses technical terms are reduced to the minimum. There will also be lectures on how to identify the trees, birds, ferns, etc. The locality in which the meeetings are held is one that abounds in wild plants, containing, among others, nearly forty species and varieties of ferns. In addition to the lectures, daily walks to attractive points are taken for the purpose of studying the wildlings. The Chautauqua begins the second week in July. Those who are looking for a good place to spend their vacation should investigate this. Some fifty lectures on other subjects by eminent men are included in the Chautauqua course. Further information may be had by addressing Dr. D. W. Howell, 400 Windsor Ave., Hartford, Conn.

The new Treasurer of the American Fern Society, and the third person to assume the duties of that office since its organization, is Miss Nellie Mirick of Oneida N. Y., who has been a member of the Society since 1896. It is a bit curious that no less than five officers of the Society have been drawn from the ranks of members admitted in that year, two of these having acted as President, and two as Vice President. Under these circumstances, we have no doubt Miss Mirick will make a most capable Treasurer, and we suggest that if there are any members of the Society who have not yet paid their dues, they will help the new Treasurer to get accustomed to the office by sending them in at once.

⁂

As this issue goes to press, the American Fern Society has a larger membership than ever before in its history. Deducting all resignations to date, it nearly reaches the 150 mark, and there is no doubt that that point will be passed during the present year. Eighteen new members have joined the Society within a year without a special effort being made to increase our numbers.

The new folder that may be sent to fern-loving friends will certainly help greatly in adding to our rolls. The present is likely to be a record year for the Society.

⁂

In response to the requests of several subscribers who would like to read the early numbers of this publication, but cannot because they are out of print, we shall begin the publication in subsequent numbers of occasional articles taken from the first five volumes. We shall only select what, in our judgment are articles that merit a reprinting, and we trust the writers of these will not rise up and complain at our bringing their early efforts before the public. This is one of the few botanical magazines that has existed long enough to assist at the beginnings of several botanical reputations. Several of those who are now foremost among fern students were just beginning to be able to distinguish the Christmas fern from the cinnamon fern and the maidenhair when the Fern Bulletin put forth its first tiny leaves. Some of these youthful efforts, however, are still worth a reading, and we hope to give the first in a short time.

⁂

Notwithstanding the wisdom of the couplet which exclaims

> "O how wondrously you vary
> *Polypodium vulgare!*"

it is probable that few of us realized the extent of the variations of this common fern within our territory until the publication of Mr. Gilbert's article. A close study of any widely distributed fern, however, is likely to give equally surprising results. This being so, it may strike the thoughtful student that it is possible to make too much of the forms in certain groups, especially in those that exhibit a natural tendency to vary.

⁂

Although a meeting of Fern Students was announced to take place at New Orleans during the holidays in conjunction with the meetings of the American Association for the Advancement of Science, the scarcity of fern students in the Gulf States and the distance of the meeting from the centers where such students are most numerous decided the promoters of the meeting to cancel it and to help swell the audience at the general botanical meetings of the Association. Three papers intended for presentation at the meeting are therefore given to the public through the Fern Bulletin. Their titles are: "*Dryopteris filix-mas* in Vermont," "An Alabama Station for *Botrychium biternatum*" and "Tropical Ferns in the Southern States."

NOTES.

A new station for *Lygodium palmatum* in the vicinity of Hendersonville, N. C., is recorded by W. C. Dukes.

It is of interest to note that British fern culturists invariably speak of young ferns as "seedlings," though the merest novice among them ought to know that ferns do not produce seeds. The fact that the word, sporeling is avoided, may possibly be set down to British conservatism.

In the catalogue of a German dealer we notice that the common polypody is called spotted fern. This will probably be a new one to most of our readers, though when one considers the distinctness with which the sori stand out on the frond, the name must be admitted to be quite as appropriate as many of the common names of ferns.

We regret to note that Miss Elizabeth Whittlesey, a well-known student of ferns and flowering plants, died at her home in Litchfield, Conn., Dec. 26, 1905. Miss Whittlesey was one of the early members of the Fern Chapter, but of late years had devoted her time to bird studies.

Two more sets of THE FERN BULLETIN have been located. The Lloyd Library, Cincinnati, O., has a full set, and Mr. J. H. Ten-Eyck Burr, Cazenovia, N. Y., by offering $1.00 a number has at last filled his set. Several sets lack only the January, 1896, number. If ten orders at 75 cents can be secured, it will be reprinted.

The second finding of *Asplenium trichomanes f. incisum* is reported from Brattleboro, Vt., by Mrs. Frances B. Horton. The first specimens were found some years ago by Miss Annie L. Grout, and none have been located since until the find of Mrs. Horton. The crested dicksonia and *Nephrodium marginale* × *cristatum* have also been found.

THE AMERICAN FERN SOCIETY.

Formerly Linnæan Fern Chapter.

The membership folder that is now ready to send out is a new departure for the Society. The front page is devoted to an invitation to membership, and succeeding pages give an account of the Society, the Officers for the year, the Advisory Council, and various additional paragraphs containing information that members will find useful. One of the back pages is a printed receipt for dues, which is signed by the Treasurer when dues are sent, and thus remains a permanent part of the folder. Copies of this folder will be sent to every member. Those who have paid dues will find their receipt included. Extra copies of this folder may be had by addressing either the Secretary or the Treasurer. If you have any fern-loving friends that are not members of the Society, by all means send them a copy.

THE WOODSIA CHAPTER.

The new Chapter of the Society, located at Muscatine, Ia., has been in existence as a fern club for nearly a year. Monthly meetings are held for the discussion of subjects pertaining to ferns, and, in suitable weather, botanizing excursions to the haunts of the rarer ferns are planned. Such excursions include picnics and other similar pleasures. The Chapter has most of the American works on ferns, and obtains both pleasure and profit from the study. The membership consists of five congenial spirits, no effort being made for a larger number because of the devastation that might ensue if a larger party visited a rare species. We trust that the chapter will have a long and pleasant existence.

At a recent meeting of the Linnæan Society Mr. Charles T. Druery recorded a case of apospory in the common polypody and of apogamic buds in *Cystopteris montana.*

ABOUT THE FERN BULLETIN

In offering back numbers of *The Fern Bulletin* for sale, we are not attempting to get rid of some surplus stock. We print hundreds of extra copies of each number for the express purpose of supplying new subscribers with the numbers issued before they became acquainted with the magazine. The great demand for these is shown by the fact that the first five volumes are out of print. volume 6 nearly so, and other volumes are becoming scarce. The illustrations and articles in these numbers are not only still of interest, but *they are becoming more valuable with age.* The price of each volume is 75c. except volume 6, which is $1.00. Volume 6 is not sold separately except to complete files of our subscribers.

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These works scarcely need description. A folder describing them will be sent, however, upon application.

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The Fern Bulletin

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WILLARD N. CLUTE, Editor

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(Formerly Linnæan Fern Chapter)

President, James H. Ferriss, Joliet, Ill.

Secretary, Willard N. Clute, Joliet, Ill.

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EXCHANGE—100 named species of rare and beautiful unios from all over the world to exchange for ferns and mosses. Many fine and rare southern kinds. Dr. W. S. Strode, Lewistown, Ill.

The remaining portion of Ontario is characterized by the frequency and extent of the outcrops of various limestone formations, and here we find the richest fern-flora.

The Catalogue of Canadian Plants, Part V., by Prof. John Macoun, has been of great service to me in the preparation of this list, and I wish here to thank the following botanists who have kindly contributed notes: Drs. J. Fletcher, John Macoun, N. Scott, P. J. Scott, J. Dearness, Rev. Dr. Campbell, Rev. C. J. Young, Messrs. J. M. Macoun, W. Herriot, J. White, W. C. McCalla, F. Mitchell, W. E. Saunders, D. W. Beadle, J. Morrison, E. E. C. Kilmer, G. L. Fisher, F. P. Gavin, and Miss A. Saunders.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. Low meadows. Rare, but distributed throughout the province.

Botrychium simplex E. Hitch. Meadows, damp woods and hillsides. Rare. Reported from a small island east of St. Joseph's Island, Georgian Bay, by J. Bell, as common; near Fort William, north shore of Lake Superior, by Macoun, and from Galt, Waterloo County, by Herriot.

Botrychium lunaria Sw. Damp meadows and thickets. Very rare. Reported from the vicinity of Lake Nipigon, Thunder Bay District, by Macoun, and Stiltsville, Carleton County, by J. M. Macoun.

Botrychium lanceolatum Angs. Low pastures and rich woods. Very rare. Reported from Martentown, Glengarry County, by Campbell, and from Niagara Falls by Cameron.

Botrychium matricariæfolium A. Br. Damp hillsides, pine woods, gravelly cliffs and thickets. Rare. Reported from Casselman, Russel County, by Fletcher, and from Belleville, Hastings County; Campbellford, Northumberland County; Nipigon River and Lake Nipigon, Thunder Bay District, by Macoun.

Botrychium ternatum obliquum D. C. Eaton. Fields and dry woodlands. Scarce, but widely distributed. Ranges north to Hudson Bay.

Botrychium virginianum Sw. Woodlands. Common throughout the province.

OSMUNDACEÆ.

Osmunda regalis L. Swamps and swales. Scarce in northern Ontario, common throughout the rest of the province.

Osmunda claytoniana L. Low ground. Frequent throughout the province.

Osmunda cinnamomea L. Swamps and swales. Apparently absent from northern Ontario, but common throughout the rest of the province. The form known as *frondosa* occurs at Belleville, Hastings County; Bismark, Elgin County, and Guelph, Wellington County. The writer has found two phases of this form, in one of which the fertile portion was terminal, and in the other basal and having some of the lower pinnæ half fertile and half sterile. In both cases they appeared on otherwise normal plants, which had not been cut or apparently injured in any way.

POLYPODIACEÆ.

Polypodium vulgare L. Rocks, in shade. Rare in southern Ontario, but common throughout the rest of the province.

Adiantum pedatum L. Moist woodlands. Common throughout the province.

Pteris aquilina L. Dry thickets and borders of woods. Common throughout the province. The writer collected, in a cedar swamp, a fern of this species, which was not at all ternate but merely bi-pinnate.

Cryptogramma acrostichoides R. Br. Rocks. Very rare. Reported from Shrieber, Thunder Bay District, by Campbell, and McLeod's Harbour, Manitoulin Island, by J. Bell.

Pellaea gracilis Hook. Moist, shady rocks. Frequent throughout the Limestone region. Found on Laurentian rock, in Frontenac County, by C. J. Young, and on Huronian slates, near Michipicotin, Algoman District, by Macoun.

Pellaea atropurpurea Link. Dry limestone cliffs. Frequent throughout the Limestone region and common locally.

Pellaea densa Hook. Limestone rocks. Reported only from Durham, Grey County, by H. M. Ami.

Woodwardia virginica J. E. Sm. Swamps. Scarce, but widely distributed over the province as far north as Muskoka.

Asplenium viride Huds. Moist, mossy, shady limestone rocks. Rare. Reported from Tabermory, Bruce County, by P. J. Scott; Inglis Falls, Grey County, by Macoun; Crecht Forks, Peel County, by White; and found by the writer on Flower Pot Island, at the head of the Bruce Penninsula, and at Rockwood, Wellington County.

Asplenium trichomanes L. Rocks. Frequent throughout the province.

Asplenium ruta-muraria L. Only known from Flower Pot Island, at the head of the Bruce Peninsula, where it was found by P. J. Scott. In August, 1905, the writer visited the island and found the fern growing in moss on dryish limestone rocks, but very scarce.

Asplenium ebeneum Ait. Rocks and rocky woods. Rare. Reported from Charleston Lake, Leeds County, by C. J. Young; Brockville, Leeds County, by Billings; Jones Falls, Leeds County, by P. J. Scott; Belleville, Hastings County, by Macoun; Niagara Falls, and Kingston, Frontenac County, by Fowler, and Port Abino, Welland County, by Day.

Asplenium angustifolium Michx. Woods. Widely distributed throughout the province as far north as Ottawa, and common locally.

Athyrium thelypteroides Desv. Woods. Frequent throughout the province.

Athyrium filix-fœmina Roth. Common throughout the province.

Scolopendrium vulgare J. E. Smith. Found only in woods on limestone ridges in Grey County and the Bruce Peninsula. Common in these situations at Inglis Falls, near Owen Sound, at Woodford, north of Woodford, at Kemble and McLean's Mountain, east of Kemble in Grey County, and north of Colpoy's Bay to two miles south of Lion's Head in the Bruce Peninsula. Found also at Durham, Grey County, by H. M. Ami.

Camptosorus rhizophyllus Link. Mossy, shady rocks. Frequent throughout the province as far north as Ottawa.

Phegopteris polypodioides Fée. Woods. Frequent throughout the province, with the exception of the Lake Erie Counties. Commonest northward and eastward.

Phegopteris hexagonoptera Fée. Woods. Frequent throughout the province as far north as Muskoka, but commonest southward and westward.

Phegopteris dryopteris Fée. Woods. Common throughout the province.

Phegopteris dryopteris robertianum Dav. Reported only from Lac Seul, Rainy River District, by R. Bell.

Nephrodium noveboracense Desv. Frequent in woods throughout the province.

Nephrodium thelypteris Desv. Abundant in swamps and swales throughout the province.

Nephrodium fragrans Rich. Rocks. Rare. Reported from Green Lake, Renfrew County, by C. J. Young; Moon River, Muskoka District, by Burgess, and as the commonest fern in the region about Lake Nipigon, by Macoun.

Nephrodium marginale Michx. Woods, cedar swamps and among limestone talus. Abundant throughout the province.

Nephrodium filix-mas Shott. Limestone rocks. Rare Reported from Royton Park, near Owen Sound, by Mrs. Roy, and from Niagara Falls, by Campbell. Found by the writer on McLean's Mountain, near Kemble, Grey County, where plants with sterile fronds were frequent but fertile fronds very rare, and at Cape Croker, Bruce County, where it was common in a limited area.

Nephrodium goldieanum Hook. Woods. Widely distributed and frequent locally. Extends as far north as Ottawa and Owen Sound.

Nephrodium cristatum Michx. Swales and wet woods. Widely distributed and abundant locally throughout the province.

Nephrodium cristatum clintonianum Gilbert. Swales and wet woods. Scarce but widely distributed.

Nephrodium boottii Dav. Swamps, swales and damp woods. Rare. Reported from Kemptville, Grenville County, by Porter; Belleville, Hastings County, by Macoun; Hamilton, Wentworth County, by Logis; London, Middlesex County, by Burgess; Snellgrove, Peel County, by White, and Innerkip, Oxford County, by Mitchell. Found by the writer at Arkell, Puslinch Lake and Pike Lake, near Mount Forest, all in Wellington County. At Belleville it was growing with *N. cristatum clintonianum* and *N. spinulosum,* and in every case where found by the writer it was growing with *N. cristatum* and *N. spinulosum.* While the Puslinch Lake specimen must for the present be included under the so-called species *N. boottii,* it is without doubt a hybrid between *N. cristatum* and *N. spinulosum,* as fronds of these two and of *N. boottii* all grew from the same root. The Snellgrove, Pike Lake and Arkell records are all for single plants. So far all the evidence obtained by the writer point to the hybrid origin of *N. boottii.*

Nephrodium spinulosum Desv. Woods. The type which includes the unstable ferns known as varieties *intermedium* and *dilatatum* is abundant throughout the province.

Polystichum acrostichoides Shott. Woods. Common throughout the province as far north as Owen Sound. The form *incisum* is reported from London and Hamilton by Burgess, and Owen Sound by Macoun, and it and the form *crispum* found at Guelph by the writer.

Polystichum lonchitis Roth. Limestone rocks. Common on the limestone ridges from Woodford west through the northern portion of Grey County, and throughout the Brüce Peninsula. Reported from Foster's Flats, Niagara Falls, by Macoun.

Cystopteris bulbifera Bernh. Moist woods and on rocks. Abundant throughout the province, with the exception of northern Ontario, where it is frequent.

Cystopteris fragilis Bernh. Rocks and woods. Common throughout the province.

Cystopteris montana Bernh. Very rare. Reported as growing in a cedar swamp north of Current River, Lake Superior, by Macoun.

Onoclea sensibilis L. Wet woods and swales. Abundant throughout the province. The form *obtusilobata* is reported from Murray, Northumberland County, by Macoun; Saugeen, Bruce County, by P. J. Scott, and Ottawa by Fletcher.

Struthiopteris germanica Willd. Damp woods, swales and stony streams. Common throughout the province, except in northern Ontario, where it is frequent.

Woodsia glabella R. Br. Moist, shaded rocks. Rare. Reported from Red Rock, Algoma District, and Kaministiquia River and Nipigon River, Thunder Bay District, by Macoun.

Woodsia hyperborea R. Br. Moist, shaded rocks. Rare. Reported from Michipicotin, Algoma District, and along north shore of Lake Superior, west of Nipigon Bay, and Jack Fish Island, Lake Nipigon, Thunder Bay District, by Macoun.

Woodsia ilvenis R. Br. Dry rocks. Common in the Laurentian region, but not reported from the limestone region. Very abundant in northern Ontario.

Woodsia oregana D. C. Eaton. Very rare. Reported as growing on rocks at Lake Nipigon, Thunder Bay District, by Macoun.

Dicksonia pilosiuscula Willd. Open woods and rocky hillsides. Common locally as far north as Parry Sound District.

EQUISETACEÆ.

Equisetum arvense L. Common throughout the province. The form *campestre* has been found at Puslinch Lake, Wellington County, by the writer.

Equisetum pratense Ehrl. Damp thickets. Rare. Reported from Owen Sound, Grey County, and Sangeen Bruce County, by Burgess; shores of Lakes Superior and Nipigon, by Macoun, and Cornwall, Stormont County, by Campbell.

Equisetum sylvaticum L. Damp woods and thickets. Frequent throughout the province.

Equisetum palustre L. Swamps and springy ground. Rare. Reported from North Hastings County and Lake Nipigon, Thunder Bay District, by Macoun, and White Lake, Renfrew County, by Campbell. Found by the writer in a swamp at Oliphant, Bruce County.

Equisetum littorale Kuhl. Bogs. Rare. Reported from Belleville, Hastings County, and Lake Nipigon, Thunder Bay District, by Macoun.

Equisetum fluviatile L. Margins of rivers and lakes and in swamps. Common throughout the province.

Equisetum hiemale L. Common throughout the province.

Equisetum variegatum Schleich. Sandy shores. Scarce. Reported from Niagara Falls by Burgess; shore of Lake Ontario, near Brighton, Northumberland County, and shore of Lake Nipigon, Thunder Bay District, by Macoun; Galt, Waterloo County, by Herriot; Toronto by Beadle; and found on Flower Pot Island at the head of the Bruce Peninsula, by the writer.

Equisetum scirpoides Michx. Wet woods and cedar swamps. Frequent throughout the province.

LYCOPODIACEÆ.

Lycopodium selago. L. Exposed rocks. Very rare. Reported from Otter Head, north of Lake Superior, by Macoun.

Lycopodium lucidulum Michx. Swamps and wet woods. Common throughout the province.

Lycopodium inundatum L. Bogs. Rare. Reported from North Hastings County by Macoun; Port Colborne, Muskoka, by Burgess, and north shore of Lake Superior by Agassiz.

Lycopodium annotinum L. Woods. Common in northern Ontario. The only stations known south of Ottawa are Snellgrove, Peel County, from where it is reported by White, and Aberfoyle and Killean, Wellington County, where it has been found by the writer.

Lycopodium clavatum L. Moist woods. Common in northern Ontario, frequent throughout the rest of the province.

Lycopodium obscurum L. Woods. Frequent throughout the province.

Lycopodium stichense Rupr. Reported only from Magpie River, north of Lake Superior, by Macoun.

Lycopodium sabinæfolium Willd. Reported only from Crane Lake, Muskoka, by Burgess, and Magpie River, north of Lake Superior, by Macoun.

Lycopodium complanatum L. Woods. Common in northern Ontario, scarce throughout the rest of the province. The status of *flabelliforme* in the province has not yet been worked out.

Lycopodium complanatum tristachyon Fernald. Reported only from Dalhousie, Lanark County, by Campbell.

SALVINIACEÆ.

Azolla caroliniana Willd. Reported only from Burlington Beach, Hamilton, by Buchan.

Selaginella spinosa Beauv. Marshes and spring places. Rare. Reported as common along the north shore of Lake Superior and shores of Lake Nipigon, by Macoun. Reported from Saugeen, Bruce County, by Burgess; shore of Bruce Peninsula, at the Fishing Lakes, by Macoun, and found in a sandy marsh at Oliphant, between the two above-mentioned points, by the writer.

Selaginella rupestris Spring. Rocks. Widely distributed and common locally in the Laurentian region.

Selaginella apus Spring. Springy places. Scarce. Widely distributed throughout the province, with the exception of northern Ontario.

ISOETACEÆ.

Isoetes macrospora Dur. Reported only from River St. Marie, at the head of the Canal, by Macoun.

Isoetes echinospora braunii Englem. Reported only from Partridge Lake, Addington County, by Macoun.

Isoetes canadensis A. A. Eaton. Reported from Crow River, above dam of Marmosa Iron Works, Hastings County, and Salt River, at head of Mud Turtle Lake, Victoria County, by Macoun.

Guelph, Ontario.

BOTRYCHIUM BITERNATUM

By L. H. McNeill.

In the late seventies and early eighties, while yet a boy, I had the extreme good fortune to be a personal friend of the late Dr. Chas. Mohr, and in his delightful company strolled through the woods in this neighborhood numberless times, gathering an education in, and a love for, the flora of our State, that has never left me. It was not until the spring of 1904, however, that the notion seized me that I should take up the study of ferns, for pastime more than anything else, but the interest grew to such an extent that at this date I find myself almost in the " Pteridomaniac " class.

After gathering our common varieties and scouring the woods for miles around for new ones, with indifferent success, I remembered the doctor had called my attention to a particular variety of *Botrychium* that he said was quite rare, it having been found in only a few isolated localities, Mobile being one of them. I also remembered the field where we found them, but alas, the inroads of civilization had turned that field into city lots and flower gardens. The character of soil, etc., was still clear in my mind, and I soon found such a place, and after a careful search, discovered, in a few scattered bunches of yellow, semi-disintegrated leaves, the *Botrychium* I was after; this was in April. Attributing its condition to an unprecedented drouth, which had been killing hardier plants, and fearing its effect might be permanent, I carefully transplanted half a dozen roots, giving them what I considered to be the proper amount of water, but they failed to revive and were, for the time, forgotten.

Late in July, the *B. obliquum,* in its various interesting but bewildering varieties, began to appear. They stayed with us until October, then came frost, and after arranging the specimens gathered that season, I started on the wait until spring should come again. Some days later (October 20), almost by accident and much to my surprise, I found my neglected roots, planted the April before, were putting out leaves. I went to the place where I had gotten them, and the same life was visible there, and within a week I had spotted more than a dozen colonies of this same fern, some of them miles from the original location. For weeks they showed no change, merely the little triangular, delicately compound leaf clinging close to the ground. On November 20, and almost suddenly, the healthier plants all showed a tightly curled but perfectly formed fertile frond in the axil of the leaf and barely above ground. They remained in this condition until late in January, when a touch of warm weather unfolded them, and in some places the ground was literally covered with them.

Hardly had this fertile frond begun to mature, in the older and more fully developed plants, than a secondary sterile frond started on the opposite side of the fertile stipe, and in an incredibly short space of time had grown alongside the primary one, having come from the same rootstock but from a separate bud. Frequently, however, primary and secondary fronds had come up at so nearly the same time that both were in fit condition for specimens. The only perceptible difference between these two growths was in the sterile fronds, the later one being less inclined to be sessile or lay flat, and owing to the more rapid development was lighter in color, straggling in shape and more delicate generally.

The age of a plant does not seem to affect its size, but tends to make it stockier, and in some cases the segments or pinnules become so crowded as to force each other on edge. It is a hopeless task to attempt to press such specimens, as they appear only a dense mass of crushed leaflets, it being impossible to arrange them with any degree of satisfaction.

In five or six weeks everything had withered and commenced to turn yellow, and by April, a little bunch of yellow chaff here and there was all that was left, and that entirely disappeared with the first heavy rains, not to show itself again until the following autumn. I have, however, seen sterile fronds appear in midsummer, but these were rare exceptions, and they soon died of the heat.

I will not attempt to describe this plant, as Professor Underwood, in his pamphlet on "The Ternate Varieties of *Botrychium*," has done so exhaustively. I can advise you as to its habitat, though, as the Professor has probably never seen one growing. It prefers a light, well-drained, sandy soil, sparsely covered with grass, usually in company with various low-growing mosses and lichens. I have found them on the shores of Mobile Bay, at an elevation of but a few feet above tidewater, and also at Spring Hill, seven miles west of the city, at an elevation of 210 feet, all showing the same habits and characteristics.

There are several authorities who are unwilling to entirely admit that this is a distinct species, but after having watched and examined dozens of living specimens of *B. biternatum* and *B. obliquum* I find differences not noted by even the Professor. The season of maturing, sessility of sterile frond and size, he has called attention to, but these further differences are also noticeable. The primary and secondary growth, before mentioned, does not occur at any time with the *obliquum* in this locality, though I may add it does with *Ophioglossum bulbosum,* which grows and blooms on exactly the same lines and in the same locations as *biternatum.* The roots of *biternatum* form a large, succulent mass, seldom more than an inch below the surface, and in the older plants are sometimes bulkier than the plant above ground, being often enclosed in a bunch of chaff, the unrotted accumulation of old stipes, from the root almost to the surface of the ground. The root of *obliquum* is generally six to eight inches below the surface, and is disposed to be straggling, the chaff hardly appearing. *Biternatum* prefers open ground in the full glare of the sun, and it is in such places it attains its typical form. *Obliquum* invariably seeks the shade of some evergreen bush or tree or dense grass. Often, however, *biternatum* is found in shady places on the edges of the open spots. Under such circumstances the growth is considerably changed, the color is a lighter green, the sterile frond loses largely its sessility, having a tendency to reach up and rarely has the secondary growth. In the open, the sterile frond is a dark reddish green, adhering closely to the ground, and under such conditions I have seen the same plant frozen until it was brittle and also undergoing the hot, dry winter sun we sometimes have, in apparent unconcern. Furthermore, *biternatum* is inclined to sport, double fronds, fertile or sterile, being quite common, and I have one specimen where three fertile heads come from a single stipe, the division taking place above where the leaf joins.

The above notes represent the careful examination and inspection of quite a number of plants and in several locations, for a period extending from April, 1904, to the present date, and so far the behavior of this odd little fern, for the two seasons, has been identical.

Mobile, Ala.

GREEN AND RED STIPED LADY FERNS.

By William Palmer.

Some dozen or more *varieties* (*?*) of the Lady fern have been recognized or named from eastern North America. Nearly all these variations, in my judgment, have been produced as a result of man's interference with the environment of the species, by changing the water content of the soil, by reducing the shade, by allowing the wind to greatly influence the growing plant, and generally by affecting the nutrition. Except, possibly, in the case of one or two, these variants have no taxonomic values. Though much has been written about this common species, very much more remains to investigate, and I have a few suggestions to make regarding two of the forms which are quite different in color, but grow together *in the same environment.* One of these has a green stipe and rachis, and I here assume that it is *A. filix-fœmina;* the other has a red stipe and rachis, which I also assume to be *A. filix-fœmina rubellum.* Gilbert, List of North American Pteridophytes, 1901, page 35.

About Washington, D. C., both in Maryland and Virginia, these two forms are common, sometimes growing in colonies close together, and in many cases clearly distinct on account of the entirely pale green of the one and the darkness of the other. Scattered about in the same wood, often near the others, are usually single plants, variously intergrading in appearance and undoubtedly filling up the gap between the two variants, besides manifesting side tendencies, especially when growing in slightly different environments. The red stiped form is usually the larger and more vigorous, and the fronds are darker with broader, often larger pinnules, but not always. The green plant is without a trace of reddish, is a pale green, is a less vigorous grower, not as apt to be found in the open as the other, is very tender and readily influenced by dryness, and the pinnules are smaller and narrower, but not always. The intergrades are common, especially in recently changed woods, but in old woods, where the forest has not been injured and one or both of the forms is common, intergrades are, I believe, absent, except where the local environment is different or influenced by man. Small green or pink stiped plants are not here considered, as they are evidently immature plants, readily affected by position, drainage, light, absence or abundance of humus. Names have been given with facility to these plants, but with little if any knowledge or care as to the age or habitat of the individual plants composing such an extremely adaptive species, and which undoubtedly has an easy habit of morphological adjustment to a varying or uneven local environment.

In Newfoundland I have never seen plants with red stipes. In South Carolina, in the vicinity of Charleston, I have only been able to collect the red-stiped form. Is it possible that all the far northern (boreal) plants are green-stiped, and all of the southern lowland coastal plain habitat (austral) are red-stiped? In the intervening area (Carolinian and Transition) we know that both occur.

The members of the Fern Society, scattered so widely in so many localities, could during the coming summer study the question. Specimens had best be examined in woods where there has been no recent interference with the forest and where the drainage has not been affected. I have replanted typical plants of each form in my garden, and am watching their behavior, hoping to catch one or the other lapsing. Why, under precisely the same environment, one should be red and the other green, is what I want to know. No plant should be considered in this connection which is growing where the sun can reach it, for its influence is effective in producing other variations. With some flowering plants age produces a deepening of the reddish stems, with which sun exposure seems to have something to do, but this is evidently not so with our woodland ferns.

Washington, D. C.

THE MOONWORT

Botrychium Lunaria.

By Willard N. Clute.

The moonwort, though rare in the settled parts of North America, is a most cosmopolitan species. It is recorded from Greenland and Alaska, and probably occurs throughout most of British America, since it extends into southern Canada. It is pretty well distributed in Europe and western Asia, as well as in the Himalayas, and according to the latest authorities occurs in Patagonia, Australia and New Zealand. In the United States the plant is one of the rarest. It was formerly reported from Connecticut, but this is now said to be due to a wrong identification. A single specimen has been reported from Vermont, and others have been found in northern Michigan, Montana, and Minnesota. In the Rockies it extends to Colorado and Utah.

In central New York, in the same general region that contains the hart's-tongue (*Scolopendrium*), plants have been found that until recently were considered identical with this species, but which are now called *Botrychium Onondagense* by a few botanists. If *Botrychium Lunaria* was not known from other parts of our country, I could look with more complacency upon the proposal to consider the New York plant a distinct species, but when we reflect how widely *B. Lunaria* is distributed and make allowances for the variation in the plant that this great range of latitude, longitude, and altitude must entail, it seems more logical to call all the plants by the name of *Lunaria.* If these plants must have a name to distinguish them, then it certainly should be *Botrychium Lunaria Onondagense.* I doubt if botanists a hundred years hence will consider the plants worth even a varietal name.

Among the characters by which the so-called *B. Onondagense* is to be known is the very short axis from which the roots spring. In our illustration, which is natural size and was drawn from a fresh specimen which is still preserved, the axis appears to be fully as long as the average for *B. Lunaria.* Another point is made of the fact that the pinnæ are farther apart, though of the same number and shape as in *B. Lunaria.* This difference is explained at once when we learn that *Onondagense* grows in woods and *Lunaria* prefers open fields and moors. It is the natural thing for plants in the sun to be more compact than when in the shade. It will not do to say that the difference in habitat makes this a different species. That any plant may have as great a variation in habitat is shown by the moonwort's rare ally, the hart's tongue, which in central New York grows in deep, moist ravines only, while in Britain it is found on walls, in hedges, and other exposed places.

The illustration is from specimens sent through the kindness of Mr. H. E. Ransier from the New York station for the plant. It is of special interest from the fact that the fertile portion bears near the fruit a sterile pinnule of the usual size, showing unmistakably that the fruiting part is morphologically closely related to the sterile portion. At the date of collection (late in May), the fruit was still green, and the apex of the panicle still slightly coiled, or rather bent over, as its habit is. It is hoped that collectors on our northern border, especially in the New England States, may have the fern in mind this year, and see if it cannot be recorded at other stations.

I wish to correct a misprint in my note on "*Scolopendrium vulgare* in Ontario" in the October (1905) Fern Bulletin. On page 105, instead of "The largest fronds I found were 13 inches long," it should read, "The largest fronds I found were 18 inches long."—*A. B. Klugh, Guelph, Ont.*

THE HART'S-TONGUE IN TENNESSEE

By Dr. E. L. Lee.

Recently I visited the station for *Scolopendrium* near South Pittsburg, Tennessee—the only reported station for the fern in the South. Whether the surroundings and peculiar locality were described at the time the fern was reported is unknown to me, but a little of its history may be interesting to fern lovers. This fern was located by Mr. Cheatham (a brother of General Cheatham), who at the time had charge of a branch of the state prison of Tennessee at the Battle Creek mines, near South Pittsburg. He was a fern lover, and was making a collection for himself and friend, when he found the *Scolopendrium* in the most unlooked for place. He believed he had discovered a new fern, and named it the Bune fern, in honor of O. R. Bune, on whose place he found it. There was no one else enthused at the time except Mr. Cheatham. Had it been *sang*, our people would have recognized it. Later, when South Pittsburg sprang into some prominence, there came to that place a Mr. Middleton, an educated Englishman and an enthusiastic botanist, who had a mania for snakes and ferns. Since they grew together in the Cumberland Mountains, he could kill two birds with one stone. He was shown the station, and we suppose the fern was reported by him.

South Pittsburg is on the Tennessee River, where it first touches the Cumberland Mountains, after its mad escape through the mountains below Chattanooga. It is two miles from the Alabama State line—five miles from Bridgeport, Ala., on the Nashville and Chattanooga Railroad, and on a branch of the above road leading to Pikeville. The flora of the Cumberland is rich and varied, especially so just at this place, or beginning at this place.

At the State line the mountain begins to lose that bold, smooth front that has characterized it for seventy-five miles north of the Alabama line—a solid wall, as it were—but here it begins to break up into innumerable spurs that jut out toward the Tennessee River, with deep, long gorges between them—a veritable paradise for the botanist. These narrow defiles are from one to six miles long, from a mile wide to as narrow as a hog trough. It is up one of these narrow defiles we will go. This particular one is very narrow, leading up into the mountain in a northwest direction, as all of them do. After following a timber road along the winter run for about a mile, we have reached a point where the bed of the ravine is our road. From this we turn to our left up a steep, and reach a little plateau, about 100 feet long and thirty or forty feet wide, that is nearly level. Looking to the west and up the steep, you see a bold stream meeting you that is pouring over the rocks, ten and twenty feet at a jump. Advance across this little plateau and you are on the edge of a chasm, fault, or rift in the rock, of a triangular shape, the sides of which are about 25 yards long and the depth about 40 feet. The walls on the three sides are perpendicular, except the little wear of the stream as it approches the chasm. There you have the *Scolopendrium* in the hole where few intruders dare to go. This place is wild and weird, even to a mountain man. The water pouring down in this abyss and disappearing is common in these mountain gorges, but this rift is a little unusual. The flow of it inclines to the northwest and grows deeper as it approaches the little pool made by the falling stream. In this hole, shut out from the sun, grows the fern. I think there must be 100 plants. Instead of standing upright, they are inclined to spread out, on the ground particularly, the outside leaves. On the left is a shelf, some three or four feet from the floor and three or four feet wide, with numerous plants on it. A majority of the plants are small, many of their fronds not more than four or five inches long. The largest I estimated at 10 inches. This possibly is due to want of light. The wonder comes as to how they got there. It is true they have a way of isolating themselves, but when I looked down in that hole it seemed that the seeds were sown there by the Creator himself, at the time "the morning stars sang together." This is surrounded by a fringe of as rich and luxuriant *Woodsias,* Christmas ferns, and *Aspidiums* as can be found in any place, and on top we saw arums, sedum, Solomon's seal, lead-plant, and many others that grew on those rich benches. The location of this fern at such a place may be a hint to those looking for *Scolopendrium.* Look in the ground for it.

Bridgeport, Ala.

THE FORMS OF BOTRYCHIUM SIMPLEX

By George E. Davenport.

I read Mr. Gilbert's note on the forms of *Botrychium simplex* in the Fern Bulletin for July, 1905, with much interest, but the forms are by no means so uncommon at the present time as his note indicates. When in 1877 my monograph on *B. simplex* was published, the species was considered as one of the rarest of all our ferns, yet even at that time my monograph contained citations for, and figures of, several specimens of *compositum* from Macoun, Dr. Parry, John Muir, Rev. J. Hermann Wibbe, Miss Pelton and Mrs. Charles Barnes. Since then I have examined many collections, quite a number of which contained one or more specimens of *compositum,* which, as I showed in my monograph, is the fully *matured form* of the species itself, and, therefore, not a true variety. Lasch originally described two forms of his variety *compositum,* one being *binate* with two divisions each corresponding to variety *incisum* (Milde), and the other *ternate* with three divisions, their common stalk being lengthened, and the fertile panicle starting from well down near the base of the whole plant, exactly as in *B. ternatum.*

Both of these forms are well represented in the Davenport Herbarium, and to my positive knowledge are to be found in some other herbaria as well. Walter Deane has a very fine example of *compositum* from Mt. Tobey in his herbarium, and it has been collected with nearly all of the other forms during the past season by Miss Rooney of St. Johnsbury, Vermont, who has favored me with some fine duplicate specimens of the same. She has also sent to me a fine tracing of a double specimen of *incisum,* the two fronds being united at the rootstock.

As to Milde's var. *fallax,* it clearly rests upon a single character, and, according to my view of it, has not been so very unusual in collections of late years. This so-called variety was established by Milde on a form of var. *incisum* with the lamina above the middle of the frond, and nothing can be clearer than the fact of the lamina happening to be incised in his plants, having nothing whatever to do with the establishment of the variety, which rests wholly on the position of the lamina in its relations to the common stipe. This being so, it follows that any specimen having the lamina above the middle of the frond constitutes the var. *fallax,* whether the lamina is simple or compound; it is, however, most likely to occur in the simpler forms, such as *simplicissimum* and *incisum.* In no instance coming under my own observation, or within my knowledge, has the lamina ever occurred elsewhere than low down near the base of the frond in the *sub-compositum* and *compositum* forms.

Medford, Mass.

With reference to Mr. B. D. Gilbert's note on the very curious variety, *Churchiæ* of *Polypodium vulgare,* it would be of interest to know whether the plant is still living, Mr. Gilbert's concluding notes leaving a doubt as to whether it failed to survive removal, or merely to produce fertile fronds. Stalked pinnæ in this genus, to say nothing of the particular species, are quite anomalous. The "corymbiense" form noted should be *Cornubiense,* it being a Cornish find.—Chas. T. Druery.

A CHECKLIST OF THE NORTH AMERICAN FERNWORTS.

(*Continued.*)

45. **Asplenium ebeneum** Ait. Ebony Spleenwort; Screw Fern. Common; in dry, or moist, rocky soils. Maine and Ontario to Florida, Texas and Colorado; also in the West Indies, Equador and Cape Colony.—*A. platyneuron* (L).

    The form **serratum** Miller is an incised form occurring with the type; **f. Hortonae** Dav. more deeply cut is reported from Vermont, Maryland and Arkansas; **f. proliferum** D. C. Eaton is a proliferous form from Florida.

46. **Asplenium ebenoides** R. R. Scott. Rare and local; on dryish rocks. Vermont to Virginia, Alabama and Illinois. Regarded as a hybrid between *Camptosorus rhizophyllus* and *Asplenium ebeneum.*

47. **Asplenium firmum** Kunze. Rare; in moist shades, Florida and Arizona; also in the West Indies. Guatemala to Brazil and Peru.

48. **Asplenium Glenniei** Baker. Very rare. Huachuca Mountains, Arizona.

49. **Asplenium monanthemum** L. Rare. Huachuca Mountains, Arizona; also in the West Indies and Africa.—*A. Monanthes* L.

50. **Asplenium montanum** Willd. Mountain Spleenwort. Rare; on dryish rocks. Connecticut and New York to Georgia, Alabama and Arkansas.

51. **Asplenium muticum** Gilbert. Rare; on moist rocks. Southern Florida; also in Bermuda. Often confused with forms of *A. trichomanes* and *A. parvulum*, and occasionally referred to *A. Anceps* Solander.

52. **Asplenium myriophyllum** Mett. In moist shades. Florida; also in the West Indies.—*A. rhizophyllum myriophyllum* Mett. The forms of this species in the United States have recently been named *A. verecundum* and *A. Curtissii* by Underwood.

53. **Asplenium myriophyllum Biscaynianum** D. C. Eaton. Rare. Southern Florida. Regarded as a species by some botanists.—*A. Biscaynianum* A. A. Eaton.

54. **Asplenium parvulum** Mart. & Gal. SMALL SPLEENWORT; LITTLE EBONY SPLEENWORT. Tolerably common; in dryish rocky soil. Virginia to Florida, Kansas and Texas; also in Jamaica.—*A. resiliens* Kunze.

55. **Asplenium pinnatifidum** Nutt. PINNATIFID SPLEENWORT. Rare and local; on dryish rocks. New York to Georgia, Alabama, Kansas and Missouri.

56. **Asplenium ruta-muraria** L. WALL RUE. RUE SPLEENWORT. Tolerably common; on dry rocks. Southern Canada to Alabama, Missouri and Michigan; also in Europe and Asia to the Himalayas.

57. **Asplenium septentrionale** (L.). FORKED SPLEENWORT. Rare; on rocks. Colorado to New Mexico and Arizona; South Dakota; also in Europe, northern Asia and the Himalayas.

58. **Asplenium serratum** L. Rare; on the trunks of trees. Southern Florida; also in the West Indies and Africa.

59. **Asplenium trichomanes** L. MAIDENHAIR SPLEENWORT. Common; on shaded rocks, wet or dry. Nearly throughout North America; also in northern Europe and Asia and in the mountain tops in the tropics. The form **incisum** Moore has

been reported from Vermont and may be looked for with the type.

60. **Asplenium vespertinum** Maxon. Southern California. Has the appearance and habitat of *A. trichomanes* with which it was formerly included under the form *incisum.*

61. **Asplenium viride** Huds. GREEN SPLEENWORT. Rare and local; on rocks. Arctic Circle to Vermont, Colorado and Oregon; also in Northern Europe, Japan and the Himalayas.

ATHYRIUM Roth.

62. **Athyrium cyclosorum** Rupr. WESTERN LADY FERN. Common; in moist shades. Alaska to California, Arizona and Nebraska.—*Asplenium filix-foemina cyclosorum* Rupr.

63. **Athyrium filix-foemina** (L.). LADY FERN; FEMALE FERN; abundant; in woods, thickets, roadsides and the borders of swamps. North America generally, giving place in the west to *A. cyclosorum;* also nearly throughout the world. A most variable species.—*Asplenium filix-foemina* Bernh.

More than twenty forms have been reported from America, the most noticeable being **angustum, furcatum, incisum, laciniatum, molle, ovatum** and **rubellum.** Less important are **confluens, elegans, exile, interruptum, latifolium, laxum, multifidum, pectinatum, plano-rhoeticum, polyclados, rectangulare, rhoeticum** and **stenodon.**

64. **Athyrium thelypteroides** (Michx.). SILVERY SPLEENWORT. Not uncommon; in moist shades. New Brunswick and Nova Scotia to Minnesota and south to the Gulf States; also in Eastern Asia.—*Asplenium thelypteroides* Michx.; *Asplenium acrostichoides* Sw. A form distinguished as *acrostichoides* Gilbert, has been reported from New York.

BLECHNUM L.

65. **Blechnum serrulatum** Richard. Rare; in moist shades. Southern Florida.

CAMPTOSORUS Link.

66. **Camptosorus rhizophyllus** (L.). WALKING FERN; WALKING-LEAF. Not uncommon; on calcareous rocks. Maine and Quebec to Minnesota, Kansas and the Gulf States. Has also been found on sandstone, shale, gneiss, quartzite and granite. There is much diversity in the shape of the base of the fronds, some fronds being rounded and some eared. The form **intermedius** Arthur with fronds tapering at base has been reported from Iowa.

CHEILANTHES Sw.

67. **Cheilanthes Alabamensis** (Buckl.). Not uncommon; on shaded rocks. Virginia to Flórida, Illinois, Arkansas and Arizona; also in Mexico.

68. **Cheilanthes argentea** (Gmel.). Very rare. Alaska; also in Siberia.

69. **Cheilanthes Californica** (Nutt.). LACE FERN. Common; at the base of shaded cliffs in moist soil California. The form **amoena** A. A. Eaton with acute tips to the pinnules is reported from Fresno County. (*C. amoena* A. A. Eaton.)

70. **Cheilanthes Clevelandii** D. C. Eaton. Tolerably common; at the base of cliffs. California.

71. **Cheilanthes Cooperae** D. C. Eaton. Rare; in crevices of rocks and in canyons. California.

72. **Cheilanthes Eatoni** Baker. Tolerably common; at the base of rooks in moist soil. Western Texas and Arizona. Closely related to *C. tomentosa.*

73. **Cheilanthes Fendleri** Hook. Rare; in crevices of the rocks. Colorado to Texas and California; also in Mexico.

74. **Cheilanthes fibrillosa** Dav. Very rare. San Jacinto Mountains, California.

75. **Cheilanthes gracillima** D. C. Eaton. Mountain Lace Fern. Tolerably common; in clefts of rocks. California to British Columbia and Idaho; also in Guatemala.

76. **Cheilanthes lanuginosa** Nutt. Not uncommon; on exposed rocks. Minnesota to British Columbia, Illinois, Texas, Arizona and New Mexico.—*Cheilanthes gracilis* Mett.; *C. Feei* Moore.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from this list.

Brodie, W. *A New Station for a Northern Fern.* Ontario Natural Science Bulletin, May, 1906. *Woodsia hyperborea* in Ontario.

Clute, W. N. *A Check List of North American Fernworts.* Fern Bulletin, April, 1906. A continuation.

Clute, W. N. *Polypodium piloselloides*, illust. Fern Bulletin, April, 1906.

Clute, W. N. *The Author Citation.* Fern Bulletin, April, 1906.

Clute, W. N. *The Forms of the Cinnamon Fern.* Fern Bulletin, April, 1906. Suggests the name of *Osmunda cinnamomea bipinnatifida* for a dissected form.

Dukes, W. C. *An Alabama Station for Botrychium biternatum.* Fern Bulletin, April, 1906. Notes on the habitat, growth, and fruiting of this plant.

Gilbert, B. D. *Polypodium vulgare and Its Varieties in America.* Fern Bulletin, April, 1906. Description of fifteen varieties, four of which are new.

Maxon, W. R. *A New Name for a Jamaican Fern.* Proceedings of the Biological Society of Washington, Oct. 17, 1905. Proposes *Acrostichum excelsum* for *A. lomarioides.*

Rooney, B. M. *The Resting of Botrychium.*. Fern Bulletin, April, 1906. Observations which point to the abortion of the fruiting parts as the cause of the "resting" in *Botrychium.*

SCHAFFNER, J. H. *The Life Cycle of a Homosporous Pteridophyte.* Illust. Ohio Naturalist, March, 1906.

SMITH, A. W. *A New Station for Asplenium ebenoides.* Rhodora, March, 1906. A Vermont station.

UNDERWOOD, L. M. *American Ferns—VI.* Torrey Bulletin, March, 1906. Species added to the Flora of the United States from 1900 to 1905.

WINSLOW, E. J. *Distribution of Botrychia.* Fern Bulletin, April, 1906.

LOMARIA SPICANT BIPINNATUM IN AMERICA

I have recently received fronds of a thoroughly bipinnate form of *Blechnum [Lomaria] spicant bipinnatum* found in Vancouver Island by Mr. Geo. Frazer of Ucluelet, Canada. The normally simple pinnæ are divided into pinnules cut to the midrib, thus entirely surpassing previous wild sports in this direction, which have never got beyond a marked serration, though in one case the offspring of one of these forms has given an almost tripinnate form, but with shortened lobes.—*Chas. T. Druery, F. L. S.,* 11 *Shaa Road, Acton, London W., England.*

The third annual meeting of the Botanical Symposium will be held from July 2d to 9th, 1906, at Mountain Lodge, Little Moose Lake, Old Forge, New York. Through the courtesy of the members of the Adirondack League Club, the privilege of occupying the Club House for one week is extended to the members of the Conference. Tickets should be bought to Fulton Chain Station on the Adirondack Division of the N. Y. C. & H. R. R. Single fare from New York City, $6.46. Board, $2.00 to $3.00 a day. Stages will meet the party at Fulton Chain Station. Botanists are requested to notify Mr. Joseph Crawford, Secretary, 2824 Frankford Avenue, Philadelphia, if they intend to attend the Symposium.

EDITORIAL.

After this issue is mailed, the business office of this magazine will be removed to Joliet, Illinois, whither our other publication, the *American Botanist,* preceded it six months ago. This change is a change of office only, and will have no effect upon the contents or size of the magazine; in fact, it is quite likely that it will continue to be printed at Binghamton. Letters relating to the magazine may continue to be addressed to Binghamton until the end of July, and if mailed later will be promptly forwarded, though in that case they will be better addressed direct to Joilet. In this connection we would again call attention to the fact that we are always willing to supply any missing or defective numbers free of charge. We want subscribers to have complete sets from the time their subscriptions began. Look over your files, and if any numbers are lacking let us know at once. We have very few copies of some issues remaining, and shall soon have to withdraw this offer regarding them.

⁂

A prominent fern student has recently taken the ground that since species are regarded as the units of classification no attention need be given to varietal or form names, and with this pretext has substituted *Isoetes occidentalis* for A. A. Eaton's *Isoetes paupercula.* This species was first described as *Isoetes lacustris paupercula,* and when Eaton considered it to have specific characters, he rightly, in our opinion, used the varietal name for the species. It makes no difference in this case that Henderson found the plant and mistaking its identity called it *I. occidentalis.* A plant once named is *named,* whether first named as a species, variety or form. If not, then the rule should work both ways, and we should be entitled to give new names to every species reduced to a variety. This latter procedure would scarcely be more absurd than the one advocated in displacing *paupercula* with *occidentalis.*

⁂

Mr. Charles T. Druery is inclined to defend the word seedling as applied to ferns, and writes in reference to the note in the April issue as follows: "Please permit me to point out that the British Fern Culturist is entirely justified in terming the young ferns raised from spores 'seedlings,' and that it is only the 'merest novice' among them that is ignorant of the reason. The student of fern biology here is acquainted with the fact that prior to the emergence of the young fern from the prothallium an embedded embryo seed is formed at the base of each archegonium, and that this seed, being subsequently fertilized by an antherozoid or pollen-grain equivalent, then acts precisely as ordinary seeds do, by producing roots and fronds, so that the resulting plant is after all a seedling. The only case where the term sporeling is alone permissible is where the young fern is asexually, *i. e.,* apogamously, produced by simple budding from the prothallium, in which case, of course, the seed is eliminated; but these are the rare exceptions and not the rule. That the word sporeling is avoided is not so much a matter of British conservatism as of British knowledge." So long as there are so many more important conflicts in names to attend to, we shall not quarrel with Mr. Druery over the name he applied to the young fern, but while the subject is up it may not be amiss to point out exactly what takes place in the fern's development from spore to spore. It may be news to many to hear that every fern produces two kinds of spores: one the kind we usually think of when a fresh spore is mentioned and which produces the prothallium; the other rarely seen, inclosed, as Mr. Druery states, in the archegonium. This cell in the archegonium, however, does not even become a spore, much less a seed, until another cell called a sperm, produced in the antheridium, has met and fused with it. Until then it is merely an egg-cell incapable of further development.

After the fusing of sperm and egg, the spore thus formed, which is termed the sexual spore, begins to grow and forms what we commonly call the fern. In no stage of its development does the fern form a seed, for the seed is a ripened ovule and consists of one or more integuments and a nucellus enclosing an embryo. If ferns really produced seeds they would be placed with the flowering plants, and it may be noted that the flowering plants are classed together, not so much because they bear flowers as because every one of them bears true seeds. As a matter of fact, some of the fernworts come much nearer producing flowers than seeds. It really looks as if the British will have to reduce their fern "seedling" to synonomy!

BOOK NEWS.

Although a very short time has elapsed since the beginning of the present century, a most unusual number of species have been added to the fern flora of the United States. Most of these have been added as the result of explorations in southern Florida, a much smaller number having been discovered in various other parts of the country. In the Torrey Bulletin for March Dr. L. M. Underwood has listed the species which he considers have been added to our flora since 1900, and figures that they number about forty-two. It is hardly to be expected in this day of species-making that the opinion of any radical botanist will find implicit acceptance by others, and many so-called species in this list will likely be ruled out as new, while others are certain to be denied specific rank. Of the new ones that are not actually new we note *Asplenium Biscaynianum, Gymnogramma viscosa,* and a dwarf form of *Aspidium trifoliatum* called *Tectaria minima,* but which should be *Aspidium minima* if anything. A wide form of the well-known *Polypodium phyllitidis* is listed as *Campyloneuron latum,* while two forms of the variable *Asplenium myriophyllum* are named *A. verecundum* and *A. curtissii.* These and others having been known before as forms, and are scarcely to be listed as new species. Again, several mere forms are included as good species, such as the forms of *Botrychium* named *Alabamense, tenuifolium, Californicum* and *Onondagense,* and the forms of *Nephrodium* named *Aquilonare* and *Pittsfordense.* In passing, the curious fact may be mentioned that Dr. Underwood, while listing at different times a great number of variants of *Botrychium ternatum*, has omitted entirely the variety *Oneidense* described by Mr. Gilbert, though it is far more characteristic than others that could be mentioned, and was described since 1900. Among the species actually new to our flora, those not previously listed in this journal are *Lomaria procera* (listed as *Stenochlæna kunzeana*), *Aspidium cicutarium* (listed as *Tectaria coriandrifolia*), *Schizæa pennula,* and *Asplenium muticum. Meniscium reticulatum* is reported on the authority of A. A. Eaton, though first reported in this magazine by the editor and J. H. Ferriss a year before Mr. Eaton ever collected it. From the list is omitted *Cheilanthes moritziana*, though this is more easily distinguished than any form of *Botrychium* described in this century! The plant reported by A. A. Eaton as *Acrostichum sorbifolium* is also omitted. In this paper we also note a curious clinging to the term macrospore, although all morphological botanists have long ago abandoned it for the more proper megaspore. The *Selaginella* mentioned in "The Fern Allies" as collected in California by Mr. Saunders is named *S. Parishii.* Six other mere forms of *Selaginella* previously described are listed.

In an old number of *Meehan's Monthly* we find a correspondent calling *Equisetum hiemale* the "dry rush." Certainly few other living plants are as dry to the touch as this one.

According to the *Gardening World*, The Country Press, 19 Ball St., Kensington, W., London, has issued a set of seven post-cards illustrating forty-two species of British ferns. The illustrations are taken from Heath's "Fern Paradise," and the set of seven cards are sold for a sixpence, though this probably does not include postage.

AMERICAN FERN SOCIETY

A postal recently received from Jamaica apprises us of the fact that Mr. W. R. Maxon is again in the Tropics.

The annual dues have been paid with commendable promptness this year. It is hoped that the few who have not yet paid will find time to attend to the matter at once.

The Society continues to increase in membership. We welcome the following new members to our ranks: Miss M. DeLongue, Trudeau, N. Y.; Miss Margaret H. Grant, 187 Bowen Street, Providence, R. I.; Miss Dorothy Furman, 58 Clark Street, Glen Ridge, N. J.; Mrs. H. D. Carter, 18 Bradford Place, Montclair, N. J.; Mrs. L. H. Green, Oakwood, Ill.; Prof. Philip Dowell, Port Richmond, N. Y.; Mr. Geo. L. Fisher, St. Thomas, Ontario; Mr. Harold G. Rugg, Hanover, N. H. The 150 mark has now been passed!

In the early years of the Society, one of the most delightful features of the work was the offering of ferns to members. This feature we have now taken up again, and it is expected that it will be continued. Prof. L. S. Hopkins, Massilon, Ohio, offers specimens of *Asplenium ruta-muraria,* and Mr. H. E. Ransier, Manlius, N. Y., offers specimens of *Pellæa gracilis.* These specimens are offered to members of the Society only, for the cost of postage. It is hoped that others will be moved to offer other specimens. It should be remembered that the Society contains both beginners and advanced students, and that species common in one locality may be rare in another. Many species not ordinarily considered rare will therefore be desirable for distribution. It is best to select the smaller species, since the large ferns cost more to mail, though there is no reason why the largest ferns should not be sent if desirable. It would facilitate matters if each person offering specimens would indicate the amount of postage necessary to be sent for them.

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In offering back numbers of *The Fern Bulletin* for sale, we are not attempting to get rid of some surplus stock. We print hundreds of extra copies of each number for the express purpose of supplying new subscribers with the numbers issued before they became acquainted with the magazine. The great demand for these is shown by the fact that the first five volumes are out of print, volume 6 nearly so, and other volumes are becoming scarce. The illustrations and articles in these numbers are not only still of interest, but *they are becoming more valuable with age.* The price of each volume is 75c. except volume 6, which is $1.00. Volume 6 is not sold separately except to complete files of our subscribers.

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The
Fern Bulletin

A Quarterly Devoted to Ferns

October

Joliet, Ill.
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1906

The Fern Bulletin

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, EDITOR

WILLARD N. CLUTE & CO., PUBLISHERS, JOLIET, ILL.

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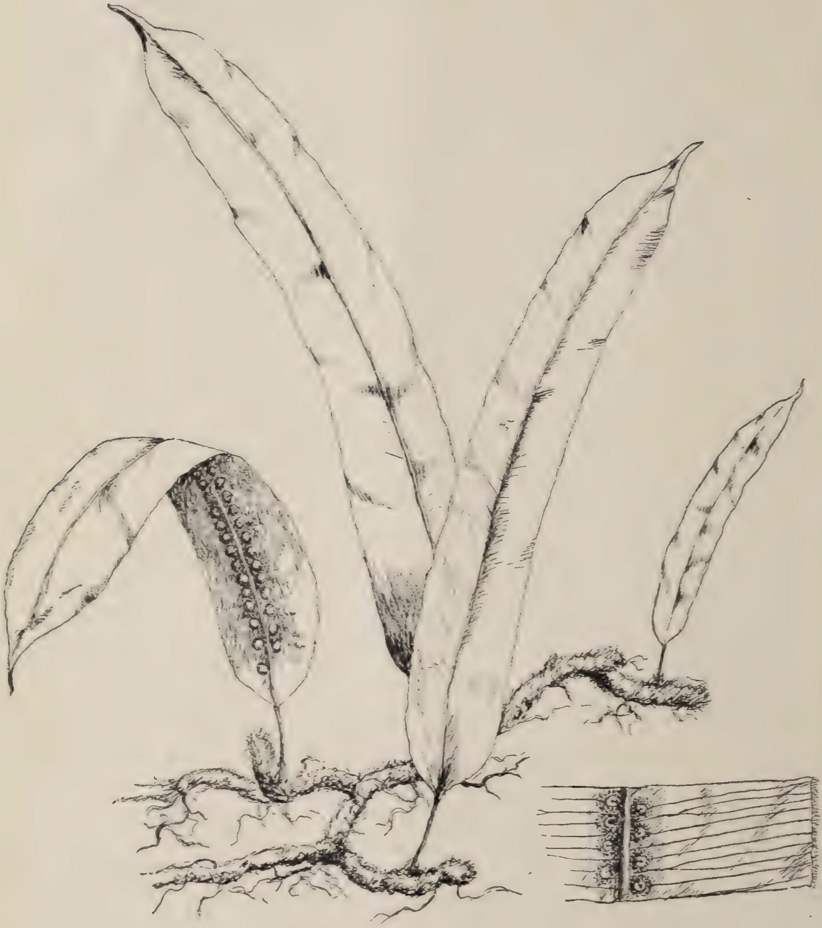

OLEANDRA WALLICHII

THE FERN BULLETIN

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LIBRARY NEW YORK BOTANICAL GARDEN

THE FERN FLORA OF MAINE

BY DANA W. FELLOWS.

The State of Maine, which forms the northeastern extremity of the United States, lies between 43 and 47½ degrees north latitude, and contains 33,000 square miles. Three important rivers flow through the southern section of the State to the Atlantic, while the northern portion, comprising about one-fifth of the entire area, is drained by tributaries of the St. John. The lakes are innumerable, Moosehead, which is thirty-five miles in length, being the largest. The Appalachian system of mountains extends across the State from southwest to northeast, reaching the highest elevation in Mt. Katahdin, 5,215 feet. Nearly the entire surface of the State is hilly.

The climatic conditions of the southwestern half of the State are similar to those of the other New England States, but the eastern coast region and the extreme northern parts show a flora containing many boreal and alpine species. A large section in the northwestern part of the State has been explored only for its timber of pine and spruce, and its flora is practically unknown. This is true also of a smaller area in the eastern part of the State away from the coast.

A division of the State on the parallel of 45° 30′ into a southern and a northern section, though quite arbitrary, will be, in most cases, sufficient for the present purpose. The southern section contains the entire coast region and the valleys of the Penobscot, the Kennebec and the

NOV 19 1906

Androscoggin rivers. The northern section consists, for the most part, of Aroostook County with an area more than three-fourths as great as that of the State of Massachusetts.

Maine produces nearly all the common ferns and fern allies of the Eastern States, but lacks a few that are found on calcareous rocks in western New England. Distinct and well-recognized varieties only have been enumerated in connection with species, and the list, thus constituted, comprises thirty-eight species and ten varieties of ferns, and twenty-seven species and six varieties of the allies, with reports, which cannot be confirmed, of two or three other species.

I wish here to acknowledge my obligations to Mr. C. H. Knowlton, Mr. E. B. Chamberlain, Miss Kate Furbish, Miss Lillian O. Eaton and numerous other correspondents whose notes have greatly assisted me in the preparation of this list of Maine ferns. Acknowledgements are also due to Mr. M. L. Fernald of the Gray Herbarium for notes and suggestions, but especially for his work in connection with the genus *Isoetes.* This portion of the list was written by him from collections by himself and others in the Herbarium of the New England Botanical Club, the Gray Herbarium and notes of Mr. A. A. Eaton.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. ADDER'S-TONGUE. In all portions of the southern section and not rare. Not known in the northern section.

Botrychium simplex Hitchcock. In various parts of the State in both northern and southern sections, but apparently not common.

Botrychium matricariæfolium A. Br. MATRICARY GRAPE FERN. Generally distributed and not rare.

Botrychium obliquum Muhl. COMMON GRAPE FERN.

Rather common in the southern section. Not seen from the northern.

Botrychium obliquum dissectum Clute. Frequent in the southern section.

Botrychium obliquum intermedium Underw. Occasional.

Botrychium lanceolatum Angs. Lance-leaved Grape Fern. Found throughout the State, but not common.

Botrychium Virginianum Swartz. Rattlesnake Fern. Throughout the State, and common especially in the northern portion.

OSMUNDACEÆ.

Osmunda regalis L. Royal Fern. Common throughout.

Osmunda cinnamomea L. Cinnamon Fern. Very common.

Osmunda Claytoniana L. Interrupted Fern. Throughout the State, but not as abundant as the two other species.

POLYPODIACEÆ.

Onoclea sensibilis L. Sensitive Fern. Common in all parts of the State.

Onoclea struthiopteris Hoffm. Ostrich Fern. Throughout the State. Frequent.

Woodsia Ilvensis R Br. Rusty Woodsia. Frequent throughout the State on rocky hills and cliffs.

Woodsia glabella R Br. Moxie Falls, Township No. 1 East of the Kennebec, Fifth range of Bingham's Purchase, Somerset Co. (J. F. Collins). The only station.

Woodsia obtusa Torr. Common Woodsia. About Mt. Pisgah, Winthrop. (H. Metcalf).

Dicksonia pilosiuscula Willd. Boulder Fern. Abundant in the southern section, not reported from the northern.

Cystopteris bulbifera Bernh. Rather common in the northern parts of the State, less so in the western and central.

Cystopteris fragilis Bernh. COMMON BLADDER FERN. Generally distributed in the State but nowhere abundant.

Cystopteris fragilis Bernh. var. *dentata* Davenp. Wells (Kate Furbish).

Polystichum achrostichoides Schott. CHRISTMAS FERN. Very common throughout the southern section, but not known north of forty-seven degrees.

Polystichum achrostichoides f. *incisum* Gray. Frequent with the species.

Polystichum Braunii Lawson. Rather common in the northern part of the State. Found also at high elevations in the western portion.

Nephrodium Noveboracense Desv. NEW YORK FERN. Found in all parts of the State and common in most.

Nephrodium Thelypteris Desv. MARSH FERN. In all portions of the State and quite common.

Nephrodium simulatum Davenp. Not common as far as known. Georgetown (G. E. Davenport), Southport (M. L. Fernald).

Nephrodium fragrans Richards. FRAGRANT FERN. In the extreme northern part of the State (M. L. Fernald), Mt. Kineo (C. E. Smith), Winthrop (H. Metcalf), Andover (J. A. Allen).

Nephrodium cristatum Michx. CRESTED FERN. Common in swamps throughout.

Nephrodium cristatum Clintonianum D. C. Eaton. Apparently rare. Farmington (H. W. Jewell), South Portland.

Nephrodium Goldieanum Hook. GOLDIE'S FERN. Not rare in the western and central parts of the State, but not known near the coast nor in the northern section.

Nephrodium marginale Michx. MARGINAL SHIELD FERN. Common on rocky hillsides throughout the State.

Nephrodium spinulosum Desv. Spinulose Wood Fern. Frequent in the southern section.

Nephrodium spinulosum var. *intermedium* Davenp. Common everywhere.

Nephrodium spinulosum var. *dilatatum* Baker. Common in the hills of the western and northern parts, and on Eagle Island, Casco Bay.

Nephrodium Boottii Davenp. Frequent in all sections.

Phegopteris polypodioides Fee. Narrow Beech Fern. Throughout the State. Common.

Phegopteris hexagonoptera Fee. Broad Beech Fern. Scarce. Found in the central and western parts of the State. Monhegan Island (M. P. Cook).

Phegopteris Dryopteris Fee. Oak Fern. Common throughout the State, especially in the north.

Woodwardia Virginica Smith. Common Chain Fern. Quite frequent in the southern section. Not known in the northern.

Camptosorus rhizophyllus Link. Walking Fern. Winthrop (H. Metcalf). The only station. Said to have been collected in Shapleigh but this was an error.

Asplenium ebeneum Ait. Ebony Spleenwort. Not common, but found at various stations in the southern section.

Asplenium Trichomanes L. Maidenhair Spleenwort. Widely scattered in the southern section, but rather scarce. Not known in the northern.

Asplenium thelypteroides Desv. Silvery Spleenwort. Fairly common throughout the State except near the coast.

Asplenium Filix-fœmina Roth. Lady Fern. Abundant everywhere with numerous varieties and forms.

Adiantum pedatum L. Maidenhair. Widely distributed but not common.

Pteris aquilina L. Bracken. Abundant everywhere.

Polypodium vulgare L. Polypody. On rocks throughout the State. The variety *auritum* Willd. is reported from Farmington (H. W. Jewell), and the variety *cambricum* Willd. from Mount Desert Island (Miss E. S. Shaw).

EQUISETACEÆ.

Equisetum arvense L. FIELD HORSETAIL. Common in numerous forms.

Equisetum pratense Ehrh. In the valley of the Kennebec and rather abundant along the St. John in northern Maine.

Equisetum sylvaticum L. WOOD HORSETAIL. Common.

Equisetum palustre L. Livermore Falls, Androscoggin Co. (C. H. Knowlton). Abundant on the shores of the St. John, Aroostook Co.

Equisetum fluviatile L. WATER HORSETAIL. Common throughout.

Equisetum littorale Kuehlw. Collected in one or more of its many forms at several stations in the valley of the Penobscot and in Aroostook Co., especially along the northern border of the State. (M. L. Fernald, O. W. Knight).

Equisetum hyemale L. COMMON SCOURING RUSH. Rather common in the southern section.

Equisetum variegatum Schleich. Kennebec River at Skowhegan and common along the St. John.

Equisetum scirpoides Michx. Quite generally distributed in the State and abundant in the extreme north.

LYCOPODIACEÆ.

Lycopodium selago L. FIR CLUB-MOSS. On mountains. Mt. Katahdin (M. L. Fernald), Mt. Desert (Rand & Redfield, Fl., Mt. Desert). Mt. Bigelow.

Lycopodium lucidulum Michx. SHINING CLUB-MOSS. Frequent throughout.

Lycopodium inundatum L. MARSH CLUB-MOSS. Not rare in the southern section.

Lycopodium obscurum L. TREE CLUB-MOSS. Common.

Lycopodium annotinum L. Common.

Lycopodium annotinum pungens Spring. Mountains of the western part of the State (E. B. Chamberlain), Mt. Katahdin (M. L. Fernald), St. Francis, Van Buren, Orono and Cutler, in bogs or cold woods. (Herb. New Eng. Bot. Club).

Lycopodium sabinæfolium Willd. Common in the extreme north (M. L. Fernald). Found also at Farmington (C. H. Knowlton), and Dover.

Lycopodium clavatum L. COMMON CLUB-MOSS. Abundant everywhere.

Lycopodium clavatum monostachyon Hook. Very frequent in various parts of the State.

Lycopodium complanatum L. GROUND PINE. Fort Kent. Island Falls and Haystack Mountain (M. L. Fernald); Pleasant Pond (E. B. Chamberlain).

Lycopodium complanatum flabelliforme Fernald. Common.

Lycopodium Chamæcyparissus A Br. In nearly all parts of the State, and common in the central and northern portions.

Lycopodium Sitchense Rupr. Mt. Katahdin (M. L. Fernald), and along the northern border of the State.

SELAGINELLACEÆ.

Selaginella rupestris Spring. ROCK SELAGINELLA. Frequent in the southern section, rare in the northern.

Selaginella spinosa Beauv. Fort Kent. (A. A. Eaton).

Selaginella apus Spring. CREEPING SELAGINELLA. Kittery. (G. L. Goodale, 1861).

ISOETACEÆ.

Isoetes heterospora A. A. Eaton. Jordan Pond, Mt. Desert Island (E. L. Rand).

Isoetes Tuckermani A. Braun. Ship Pond, Elliottsville and Great Pond, Mt. Desert Island (M. L. Fernald); Oldtown (F. L. Harvey).

Isoetes Tuckermani, borealis A. A. Eaton. Pushaw Lake, Oldtown (F. L. Harvey); Somes Stream and Great Pond, Mt. Desert Island (Rand, Kennedy, Fernald); Kennebago Lake (F. V. Coville).

Isoetes Harveyi A. A. Eaton. Pushaw Lake, Oldtown (F. L. Harvey); Mt. Desert Island (M. L. Fernald).

Isoetes hieroglyphica A. A. Eaton. Lakes of the St. Francis River (C. G. Pringle; St. John River at St. Francis (M. L. Fernald); Moosehead Lake (F. L. Harvey); Rangeley Lakes (F. V. Coville).

Isoetes echinospora Braunii Engelm. Of general distribution.

Isoetes echinospora muricata Engelm. St. John River at Madawaska, St. Croix River at Masardis, Penobscot River at Orono, Dead River, Somerset Co., Great Works River at North Berwick (M. L. Fernald), Moosehead Lake (F. L. Harvey), Androscoggin River at Mechanic Falls (J. A. Allen).

Isoetes Dodgei A. A. Eaton. Pease Pond, East Wilton (M. L. Fernald), Cornish (J. W. Chickering), Kennebunk (Gray Herb.)

——— *Botrychium Lunaria* Sw. This has been reported from several stations, but plants seen are not satisfactory, and it is doubtful if the species has been collected in the State.

——— *Woodwardia angustifolia* Smith. This species has been reported from Acton, Brownfield and Wells, all in the southern part of the State, but no herbarium specimens are known and the plant has not been collected recently.

Portland, Me.

POLYPODIUM VULGARE VAR. ALATO-MULTIFIDUM, VAR. NOV.

By B. D. Gilbert.

After my monograph of the varieties of *Polypodium vulgare* in this country was in print for the April Fern Bulletin, I received specimens of a variety which I had never seen before, and which is as peculiar and striking as anything in this list. The fronds measure from 20 to 33 cm. in length and are all beautifully multifid and fruited at the tips. The pinnæ are acute, hardly acuminate, much as in the variety *angustum,* but at the base expand on each side so as to form a wing to the rachis. The expansions of the lower side however are much larger than those of the upper. Those of the lower side extend downward in triangular shape about 1 cm. and meet the short extension from the upper side very near the rachis, thus forming a continuous wing. In the larger auricles a vein springs from the rachis instead of the costa, and sends a branch both upward and downward, but I have not detected any anastomosing.

The plants were discovered by Mr. Edward R. Heacock at Mauch Chunk, Pa., Oct. 15, 1905. They were growing in a clump on red sandstone. Mr. Heacock says: "I brought a part of the original clump home, divided it, and planted one part in the green house, and one outside. The situation was a big rock slide, and every ledge of the upheaved red sandstone, wherever there was room for leaf-mold to collect, was covered with this handsome fern." In another letter he says: "I judge it is a fairly constant variety, for a part of the original clump which I brought home to the green-house, has sent up similar fronds for this season."

Clayville, N. Y.

THE GENUS OLEANDRA.

By Willard N. Clute

As relationships go in the fern world, a few families contain a majority of the species. Such genera as *Polypodium, Pteris, Asplenium, Trichomanes,* and *Nephrodium,* represented in our region by from one to half a dozen species, in other climes include many hundreds. Clustered about these great genera are various smaller ones which resemble the leaders in many particulars, but differ enough to have generic names of their own. Related to *Pteris* we find *Pellæa, Cheilanthes, Adiantum,* and others whose species often so closely resemble that genus that they are mistaken for members of it. Similarly about *Nephrodium,* we find *Aspidium, Sagenia, Polystichum, Nephrolepis* and the subject of this note. Like its near ally, *Nephrolepis,* the genus *Oleandra* is what is called a " natural genus," that is, the species are all so much alike that they would be recognized as members of the genus whether found in fruit or not. Except for this peculiarity of habit, there is little to warrant their separation from *Nephrodium.* The sori and indusia are practically alike and fixed to the fronds in the same manner, thought their location on the fronds is quite characteristic. In all the species the fruit-dots are found in a single or double row not far from the midrib and parallel to it, as shown in our illustration. The rootstock is usually scandent or creeping, and covered with silky scales. Along this rootstock at intervals the fronds appear, being jointed to it by an articulation near the base of the stipes.

There are about half a dozen species of *Oleandra* in the world, but these are widely distributed. There are two in the American tropics, one in India, one in Africa, and two in Ceylon, Assam, and the East Indies. The species figured is *O. Wallichii,* from Northern India, collected by C. W. Hope, author of a work on the ferns of that region.

WHERE FLORIDA FERNS GROW.

By Henry H. Negley.

The rarest and most difficult ferns to procure in Florida are only to be found about 31 miles from Miami, down the coast and inland about 6 miles, so that to get them you have to drive from Miami. The road from Miami to Cutler (15 miles) is a beautiful drive, a good smooth, solid roadway all the distance. It runs through a series of dense jungle hammock for about three-quarters of the distance, but frequently striking salt marsh prairies which lay between the road and Biscayne Bay. It is an ideal drive in every respect. Quite a number of large grape fruit groves are to be seen in all stages of advancement, from those but recently planted to those 6 years old, bearing golden fruit. These groves were all originally hammock land. The town of Cutler is but a scattered village of some dozen houses and a fairly good hotel. It is situated on a slope overlooking the bay. The section of country in which the greatest number of ferns grows lies about 16 miles southwest from Cutler, and the only way to reach it at present * is by the newly made homestead trails, for that is all they can be called. One trip over this road in a buggy will certainly cure the most stubborn case of liver complaint. It is the roughest section of Florida that I have yet visited. It alternately traverses very rocky pine timber and scrub palmetto land and swamp prairie, the latter the natural drainage of the everglades to the bay. As they approach the bay they decrease in width and become creeks (here called rivers). These prairies vary in width from one-quarter to one mile, and in the rainy season are covered by water from two to four feet in depth. Roads across these places are

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* Since this was written the railroad has been extended to within a few miles of the place described.

what are called corduroy, and you can imagine how smooth they are. The drive from Cutler to our destination was a decidedly rough one, but still not devoid of interest, as we occasionally explored some small hammocks on the way, but found nothing of special interest. Our destination was the last new homestead in Southeast Florida, north of Cape Sable. Our plan was to get to our grounds the first day, and be prepared to make an early start the next morning. I was very fortunate in securing the services of a gentleman in Miami, a nurseryman, and who, by the way, is a man after my own heart; not a botanist, but an enthusiast like myself. He had been over the ground in December or January previous, with Mr. Oakes Ames and a Mr. Eaton.

To those not familiar with these regions, it might be well to explain what hammocks are. They vary so much in character that a general description must suffice. Most of them seem to be spots where nature in past ages has been more lavish in depositing soil, and as a result of climatic conditions vegetation has taken hold and from year to year has added to this deposit of virgin soil, resulting finally in a dense jungle growth of live oaks, gumbo-limbo, immense lianas, vines and shrubbery, the ground generally being covered with ferns, *Tillandsia,* etc. The larger trees are also covered with *Tillandsias,* ferns, and orchids, mostly *Epidendrums.* Most of these jungles are so dense that it was necessary to cut our way through with a Cuban machette, which my friend Mr. J. Soar used most skillfully. The southermost hammocks we visited are exceedingly rocky, and will hardly ever pay for their clearing out. The rock is a carbonate of lime formation, and taken as one large mass, very much resembles an immense flat sponge. The rock is perforated with what are called pot holes, in size from six inches in diameter to ten or fifteen feet, mostly about four to six feet, varying in depth from four to fifteen feet. The larger ones very much resemble a nicely built up well, whose walls are quite perpendicular. Some are of an oval shape, some few being quite irregular. The hammocks that we visited are exceedingly dangerous to walk over, and one has to be very careful, using a cane to prevent his stepping into one of these pitfalls, as from time to time limbs, leaves, and fern fronds conceal their openings. As an evidence of their dangerous character I am now limping about with an exceedingly badly sprined knee and limb, which the doctor says may continue for some time. It was quite unfortunate but as I was getting over a large fallen tree I slid into one of these traps and thought I had broken my leg.

The whole trip was truly a revelation to me, and I feel well paid for all the trouble experienced. In as few words as possible I will describe how and where most of these ferns grow. It is quite an interesting study to note the selection of location (shady or open light), nearness to or on the surface of the ground, or depth in these wells, in which these ferns thrive. A few feet in depth either way seems to mean their destruction, or at least the conditions for their reproduction are not favorable. In describing some of these conditions I will do so generally, except to indicate the depth in these wells in which some of the smaller ferns grow.

Asplenium myriophyllum. Hammocks in pot holes not lower than four feet below the surface; quite abundant. Think this fern would make quite a fine one for fern dishes and baskets. It certainly is a beauty, covering as it does the walls of some of these holes.

Tectaria ———. New, quite dwarf in habit, pot holes, same relative position as No. 1. Abundant.

Tectaria trifoliata. Hammocks; rather scarce. Grows only on the upper edge of pot holes, sometimes forming a beautiful fringe around the holes.

Phegopteris ———. Hammocks in pot holes, not nearer to the surface than five to eight feet; very rare and exceedingly scarce. Mr. Eaton claims to have found it in December, 1903, for the first time in the United States.

Phegopteris reptans. In hammocks; quite rare. Grows a few feet nearer surface than the preceding. Has not only upright growing fronds, but also those that creep and root, as shown by specimens.

Trichomanes Kraussii, sheet fern. In hammocks. Grows on walls anywhere below the surface, either on wood or rock; quite abundant and exceedingly pretty, often covering entire walls.

Nephrodium patens. Hammocks, in rich, moist places; tall; quite common in Florida; very beautiful, growing very much like the tree ferns of Jamaica.

Polypodium phyllitidis. Common. Grows all over the southern part of the State in shady situations, on the ground as well as on rotted logs, stumps, and even on live trees along with *Tillandsias;* often grows to the height of four feet.

Polypodium incanum. Common. Grows on trees, particularly on live oaks. Often called resurrection fern in Florida. I had difficulty in getting live fronds this time of the year.

Polypodium swartzii. Very rare; only found in two places in the State. Grows on the ground and climbs trees to a height of 12 feet. Exceedingly beautiful (I send pressed specimens). Where we found it was a dense jungle extending over about half an acre.

Adiantum tenerum. Common in southern Florida, in very moist and well-shaded hammocks. Grows to the height of two and half feet. In one place we found it exceedingly abundant and a beautiful sight it was. It is largely used in the hotels belonging to the Florida East Coast Railroad as a table (and exchange) decoration.

Pteris longifolia. Quite common in extreme southern Florida on rocky land.

Vittaria lineata. With long grass-like fronds. It grows in dense hammocks on cabbage palmetto trees. Often covering the trunk with its beautiful fringe-like foliage; quite common.

Nephrodium unitum glabrum. Common in the State. Grows in wet places along rivers.

ASPLENIUM EBENOIDES IN CHESTER VALLEY, PA.

By T. Chalkley Palmer.

The infrequency of this species will, perhaps, warrant a short notice of its appearance once more within a few miles of its original station. These plants were found on September 8th of the present year growing on a mossy ledge of the Chester Valley limestone seven miles west of the Schuylkill and within the limits of Chester County. The situation is shaded and the exposure is to the north. The ledge is not exactly damp—it is only not dry.

One of the plants has long spore-bearing fronds and has evidently survived more than one cold season. The other two were younger. All were vigorous and healthy. The fronds were altogether typical and the lower pinnæ distinctly resembled those of *Asplenium platyneuron* as did, quite uniformly, the lower half of the rachis. The plants grew within a foot or two of each other. There is no intention to discuss, here, the question of hydridity. However, the companion plants to these were preëminently *Asplenium platyneuron* and *Camptosorus*.

Media, Pa.

Dr. R. J. Smith, Milpitas, Santa Clara County, California, notes that *Selaginella Bigelovii* is not confined entirely to Southern California. It grows quite freely in Alum Rock Canyon, Santa Clara County, about seven miles east of San José, at the foot of Mt. Hamilton. On a very steep bank with northeast exposure are many little clumps of bright green, some a yard or more across. After the first rains in the fall they are very noticeable while other plants are still brown.

ON CULTIVATING OUR FERNS

BY JAMES H. FERRISS.

Ambitious to grow all the American ferns in the Joliet park I have made a summer trip to Colorado and two winter excursions to western Texas, New Mexico and Arizona, and I am going again. Members of our society have given me generous assistance and the nurserymen, pay or no pay, have been very kind. I have a soft spot in my heart for a lot of these people I never have seen and when ferns die or park commissioners grumble I am cheered on by an assurance that I will meet all of these good people over on that shore where the ferns grow everlasting and so big the heathen cannot pull them up.

All but a very few of our American ferns, and a great many others have seen the park alive. Alas, some are now dead. The Canadian ferns give me as much trouble to grow as the curiosities of the rocks and desert. I have experienced help in the greenhouse, but other business preventing my giving daily attention to the ferns is a large factor in our failures. But there is something in our soil, water or air, I fear, that makes trouble. At least some kinds always remain stubborn; others have a constant habit of petering out little by little, while others never die. There always remains the hope however of discovering a situation that will pull these failures through the next time. *Lygodium palmatum* will not grow at all but *L. Japonicum* thrives like a weed. *Ceratopteris* does fairly well at the Missouri Botanical Garden in rain water, but in our creek or well water it declines to the end in six months. *Schizaea, Polypodium Swartzii, Cheilanthes Lindheimeri, Asplenium serratum, A. pinnatifidium, A. septentrionale, A. montanum,* and *Woodsia alpina* have never put out new fronds.

Many others put out one or two fronds and die with the effort. Among these are *Gymnopteris triangularis* and *G. hispida, Notholaena Schaffneri, N. Hookeri, Vittaria lineata, Cheilanthes Californica, C. Wrightii, Pellaea aspera, P. densa,* all the *Woodwardias, Asplenium vespertinum, A. viride, A. dentatum, A. fontanum, A. Bradleyi, Nephrodium fragrans, N. patula, Polystichum lonchitis, P. scopulinum,* and *P. aculeatum lobatum, Woodsia ilvenis,* and *W. glabella.*

This is not a very good record for the president of the greatest fern society in the world, and I have not told you all either, for *Polypodium Scouleri* continues year after year a mere runt, and *Psilotum nudum* is dead. These are mere samples. *Equisetum telmateia* never starts, though *E. Funstoni,* of San Bernardino, California, lives out of doors and thrives. The *Lycopodiums* are a discouraging lot.

In the Southwest I found all the ferns catalogued for the territory visited except *Asplenium Glenniei, Cheilanthes leucopoda, Notholaena Parryi, N. Aschenborniana* and *N. tenera.* In southern Texas I found *Cheilanthes Moritziana,* a South American species, and *Adiantum tricholepis f. glabrum,* Clute, and *Pellæa aspera f. compacta,* the two latter new. In Arizona, *Polystichum aculeatum lobatum* and *Polypodium falcatum,* new to the territory. The latter grew on the roof of a dry cave twenty or thirty feet from the sunlight in company with *Asplenium parvulum* and *Pellæa ternifolia. Polypodium hesperium* grew on the hot side of a cliff 8,000 feet above the sea. *Polypodium thysanolepis* has the habit of *P. vulgare,* abiding upon a shady, dry rocky shelf.

In a well-drained spot and the warmest in the greenhouse *Cheilanthes tomentosa* and *C. Eatoni* are as thrifty as in their wild state. It is the same with *Notholaena sinuata, N. ferruginea, N. nivea, N. dealbata,* and *N. candida, Pellæa ternifolia, P. flexuosa, P. intermedia,* and *P. pulchella* and *Asplenium monanthemum. Phaner-*

ophlebia auriculata (*Aspidium juglandifolia*) is not far behind.

The ferns are finicky in their choice of abode. A limestone gulch was built for *Scolependium vulgare* and *Pellæa gracilis.* They are pleased with it, and many youngsters now nestle in the limestone niches. Other ferns mildew and damp off here, but thrive in the dry rocks. One corner of the greenhouse will grow a species that will not thrive in any other spot. Fern life is much of a chance. In Arizona a species that poisoned sheep was reported by the ranchmen, and also one or two used for a beverage, steeped as tea, but from the description given I could not determine what species was referred to in either case.

While the flora of mountain and desert is large in the aggregate, the colonies are so scattered and in such inaccessible places I felt that these trips were exceedingly feeble efforts. The ground was scarcely scratched. Besides I am interested in snails, land snails in particular. In the Florida, Chiricahua and Huachuca mountains I found twenty-three species and varieties, one of these a new genus—*Infundibularia tuba,* Pilsbry. Some had whiskers and wool, some were like cornets, and bugles, and they had all sorts of stripes and colors. The snails are interesting and the ferns hang high in Arizona.

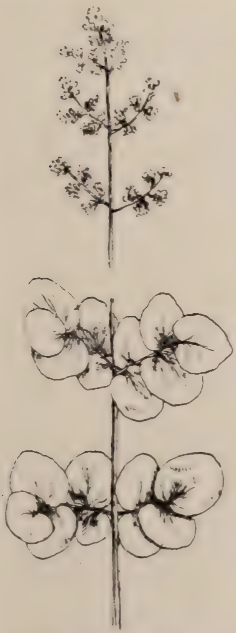
Joliet, Ill.

In the October FERN BULLETIN, Mr. A. B. Klugh says "*Scolopendrium vulgare* has been recorded in Ontario only from Owen Sound and Durham, both in Grey County." Durham is about 30 miles *south* of Owen Sound. In 1903 I found the fern in abundance, with the other ferns mentioned by Mr. Klugh, on the limestone ridge near Collingwood, at a point 22 miles directly *east* of Owen Sound, and this was recorded by Mr. House in THE FERN BULLETIN for October, 1903. The limestone ridge is on the border line between Grey and Simcoe Counties, Ontario.—*W. A. Bastedo, M. D.,* 120 *W.* 58*th St., New York City.*

RARE FORMS OF FERNS.—I.

A ROUND-LEAVED ROYAL FERN.

We illustrate, herewith, a curious form of the royal fern (*Osmunda regalis*) from Hartland, Vt., collected by Harold G. Rugg. The figure shows the two middle pairs of pinnæ and a part of what appears to be the normal fruiting apex. Specimens are at hand, however, in which the apex of the frond is leafy and the sori borne on reduced pinnæ lower down. An examination of these latter, however, discovers that they are but incompletely fertile, most of the sori being scattered along the margins of leaf-like expansions. Because of this latter characteristic, some fern students, who have seen the specimens are inclined to call the species *Osmunda Claytoniana*, and others have suggested a hybrid between this and *O. regalis*. The veining and texture of the pinnules is so evidently that of *O. regalis*, however, that the aberrant fruiting may be disregarded, since it is not uncommon for abnormal fronds of any of the *Osmundas* to deviate from the usual in this respect. In the present specimens it is interesting to note that the imperfectly fertile pinnæ have veins tipped with spore-cases that spring from the surface of the pinnæ instead of from the edges.



The fern illustrated has been growing on the farm of B. P. Ruggles for the past twenty years and therefore seems worthy of a name to designate it. I would accordingly call it *Osmunda regalis* f. *orbiculata*. It may be described as follows: Rootstock as in the type;

fronds 6-15 inches high, 2-3 inches wide; pinnules 5-7 to each pinna, orbicular or cordate crowded and overlapping; pinnæ about ten pairs. Type in my herbarium. A form of this fern found in Ireland by Phillips has been named f. *rotundata,* but judging from the rather meager description it is not identical with the specimens here described.—*Willard N. Clute.*

A NEW STATION FOR SELAGINELLA DOUGLASII

By Walter Albion Squires.

Selaginella Douglasii is said to be one of the rarest of the fern allies in collections. Maxon in his List of the Ferns and Fern Allies of North America says that it is found from northern California to British Columbia. So far as I have been able to learn, it has never been reported from Idaho or eastern Washington and Oregon.

In the autumn of 1904 I first noticed the delicately beautiful foliage of this plant on mossy shaded banks in the Bitter Root Forest Reserve of Northern Idaho. Since then I have found it at many places along the Middle Fork of the Clearwater river from the point where I first discovered it to the junction of the middle and south forks of the Clearwater at Kooskia. In cool shady spots at the foot of the precipitous hills, which form the southern wall of the Clearwater canyon it is often abundant. Its long creeping stems often spread over rocks and banks of earth with a delicate lace-like covering of beautiful green.

Whether or not its range crosses the Bitter Root Mountains into Montana I was unable to ascertain. I hope to make further investigations next summer and would be glad to collect specimens of this plant for readers of the Fern Bulletin who wish them. It seems to me that more of our fern students should become acquainted with this delicate little plant, perhaps the most beautiful of our *Selaginellas.*

Kooskia, Idaho.

THE RUSTY WOODSIA IN CULTIVATION.

By Mrs. J. J. Puffer.

I was much interested in the article about the fernworts on Mt. Tom, Massachusetts, in the October Bulletin of 1905. Several years ago I visited Mts. Tom and Holyoke, and saw those same fernworts, the rusty *woodsia* and rock *selaginella,* growing—no, just barely existing—on the seemingly bare rocks, trampled upon and exposed to the full heat of the summer sun till they were dried to a crisp, and out of pity for them I loosened one tuft from its hold with my fingers and brought it home, and now you ought to see it!

I was told then that they would not grow unless on a mountain, but, with woman's natural persistency, I vowed I would make them grow if I had to build a little mountain for them. On arriving home, I looked over the situation and chose a stone wall which was banked to the top with earth on one side. There I set them as close to the stones as possible, and covered their roots with flat stones, leaving only a crevice for them to grow up through.

They are now large, thick tufts of fronds six inches and more high, and fully equal to any I have ever seen in their natural haunts, and I have taken specimens from Mts. Wauchusett, Greylock and Holyoke, where they had more soil and partial shade, which they seem to prefer. My plants increase in size of tufts, and also new plants from spores are often found.

Along with them, on the same wall, I have the rock-fern (*Woodsia obtusa*), *Cystopteris fragilis,* and the little maiden-hair spleenwort. At the foot of the wall on the face side are the ebony spleenwort and *Asplenium thelypteris,* all thriving on the same soil.

Sudbury, Mass.

A CHECKLIST OF THE NORTH AMERICAN FERNWORTS.

(*Continued.*)

77. **Cheilanthes lendigera** (Cav.). Rare; on rocks. Huachuca Mountains, Arizona; also southward to Equador.

78. **Cheilanthes leucopoda** Link. Very rare; on shaded rocks. Western Texas; also in Mexico.

79. **Cheilanthes Lindheimeri** Hook. Rare; on shaded rocks. Western Texas and Arizona; also in Mexico.

80. **Cheilanthes microphylla** Sw. Not uncommon; on rocks in sun or shade. Florida, Western Texas, Arizona and New Mexico; also in Mexico and the West Indies. The form **elegans** Baker is reported from Arizona and California.

81. **Cheilanthes Moritziana** Kunze. Not uncommon; on moist rocks in sun or shade. Texas and tropical America. Resembles the preceding but the fronds are broadest at base.—*C. microphylla Moritziana* (Kunze).

82. **Cheilanthes myriophylla** Desv. Rare; on rocks. Texas and Arizona; also from Mexico to Chili.

83. **Cheilanthes Parishii** Dav. Very rare; San Jacinto Mountains, California.

84. **Cheilanthes Pringlei** Dav. Rare; at the base of rocks. Arizona.

85. **Cheilanthes tomentosa** Link. Not uncommon; on dry rocks in sun or shade. Virginia to Missouri, Georgia, Texas and Arizona; also in Mexico and the West Indies.

86. **Cheilanthes vestita** Sw. Rather common; on gneiss rocks. Connecticut to Missouri, Georgia and Texas, more common in the south.—*C. lanosa* (Michx.).

87. **Cheilanthes viscida** Dav. Not common; in dry soil in shade. California.

88. **Cheilanthes Wrightii** Hook. Somewhat rare; on open grassy knolls. Western Texas, Arizona and New Mexico.

CRYPTOGRAMMA R. Br.

89. **Cryptogramma acrostichoides** R. Br. ROCK BRAKE; PARSLEY FERN; PEA FERN. Not uncommon; on dryish cliffs and talus slopes. Labrador, north shore of Lake Huron, Colorado and California to the Arctic Circle. A closely allied species, of which this is often considered a variety, is common in northern Europe and Asia. The form **foveolata** Ruprecht is reported from British Columbia and Alaska.

90. **Cryptogramma gracilis** (Michx.). SLENDER CLIFF-BRAKE. Common; on moist limestone cliffs, rarely found elsewhere. Pennsylvania, Illinois, Iowa and Colorado northward; also in northern Asia. This species is as well placed in the genus *Pellæa* as here. The dimorphic fronds are regarded as characteristic of *Cryptogramma*—*Cryptogramme Stelleri* (Gmel.); *Pellæa gracilis* (Michx.).

CYSTOPTERIS Bernh.

91. **Cystopteris bulbifera** (L.). BLADDER FERN. Abundant; on moist, shaded rocks, especially limestone. Georgia and Arkansas to Canada.—*Filix bulbifera* (L.).

92. **Cystopteris fragilis** (L.). BRITTLE BLADDER FERN; COMMON BLADDER FERN. Abundant; on rocks wet or dry and occasionally in alluvial soil. Throughout North America and in most parts of the earth from the tropics to the Arctic Circle. —*Filix fragilis* (L.).

The form **angustata** Link is a narrow form from Vermont; **f. dentata** Hook. is a dentate form reported from New York and California; **f. laciniata** Dav. is a more deeply cut form from New England; **f. Mackayi** Lawson is from Nova Scotia; **f. magnasora** Clute is a form with very large sori, found on dry rocks in New England, New York and Pennsylvania.

93. **Cystopteris montana** (Lam.). MOUNTAIN BLADDER FERN. Rare; on shaded rocks. Labrador, north shore of Lake Superior and Colorado to Alaska; also in northern Europe and Asia.—*Filix montana* (Lam.).

DAVALLIA Smith.

94. **Davallia clavata** Sm. Rare; on moist rocks. Southern Florida; also in the West Indies.—*Odontosoria clavata* (Sm.).

DICKSONIA L'Her.

95. **Dicksonia punctilobula** (Michx.). BOULDER FERN; HAY-SCENTED FERN; FINE-HAIRED MOUNTAIN FERN; PASTURE FERN; SWEET FERN. Abundant; in pastures, thickets and along roadsides, especially in upland regions. Georgia and Alabama to Michigan and Canada.—*Dicksonia pilosiuscula* Willd.; *Dennstædtia punctilobula* (Michx.).

The form **cristata** (Maxon) is a crested form from Massachusetts (*Dennstædtia punctilobula cristata* Maxon); **f. schizophylla** Clute is a narrow incised form from Connecticut.

GYMNOGRAMMA Desv.

96. **Gymnogramma hispida** Mett. Rare; on exposed rocks in elevated regions. Western Texas, New Mexico and Arizona; also in Mexico —*Gymnopteris hispida* (Mett.): *Bommeria hispida* (Mett.); *Gymnogramma Ehrenbergiana* Underw.

97. **Gymnogramma triangularis** Kaulf. GOLDEN-BACK FERN; GOLD FERN. Common; in exposed situations. California to Alaska near the coast; also southward to Equador.—*Gymnopteris triangularis* (Kaulf.); *Ceropteris triangularis* (Kaulf.).

98. **Gymnogramma triangularis viscosa** D. C. Eaton. Rare; in exposed situations. Mountains of San Diego county, California, and Santa Catalina Island.—*Ceropteris viscosa* (D. C. Eaton).

MISCELLANEOUS NOTES

A few years ago Jenman described a species of *Acrostichum* which had previously been confused with *Acrostichum aureum.* To this species he gave the name of *A. lomarioides.* There is still a disposition among some writers to regard these two species as but forms of a single species, but nobody who has ever seen them in the field would so regard them. Seventy-three years ago Bory de St. Vincent gave the name *Acrostichum lomarioides* to another plant. This name, however, has not continued in use, notwithstanding which, W. R. Maxon proposes that the plant we now call *A. lomarioides* be renamed *A. excelsum.*

The December (1905) number of the Japanese *Botanical Magazine* reports that the wood horsetail (*Equisetum sylvaticum*) has recently been found for the first time in Japan.

It is a pity the BULLETIN cannot see its way to ignore the name *Dryopteris* as a synonym for *Nephrodium* or *Lastrea.* I have pointed out more than once the ill-founded nature of it, and the consequent absurdity of adding to the synonymic confusion by its adoption. On page 55 in the "Index to Recent Literature" this confusion is exemplified by reference to *Nephrodium filix-mas* in Vermont (Brainerd), and *Dryopteris filix-mas* in Vermont (Hazen), both obviously relating to the same thing. —*Chas. T. Druery, London, England.* [Mr. Druery should remember that we have in this country a party of radicals who take themselves quite seriously and use *Dryopteris* on all occasions. Ever since they went off on this tangent we and others have labored to show them the error of their ways, but some of them have replied, "What do we care about the Old World? We cannot let the rest of the world interfere in an American nomenclature." If they insisted on *Dryopteris* only, we should not so seriously object, but think of *Filix* and *Matteuccia* and *Ornithopteris!* Last year the Vienna Congress spoiled their nonsensical doubling of the generic name, such as *Phegopteris Phegopteris,* but it would take an Act of our National Congress to make them desist from changing names entirely. It is not likely that the radical names will ever become common in America, and for the same reason that a dog wags his tail. The dog wags his tail because the tail cannot wag the dog!—ED.]

CAUSE OF RUSTED FRONDS.—The cultivated ferns in the Joliet and the Chicago parks are browned or rusted in the early spring. The cold rainy nights seem to do this. The sensitive fern (*Onoclea sensibilis*) is the first to be attacked for the last half dozen seasons at least. The native ferns suffer most. Following *Onoclea* will be both species of *Cystopteris. Adiantum pedatum, Asplenium thelypteroides* and *A. filix-fœmina* in their order. The fronds attacked die down and new fronds usually take their places later. Can any suggest a cure? —*James H. Ferriss, Joliet, Ill.*

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from this list.

Clute, W. N. *A Check-List of North American Fernworts.* Fern Bulletin, July, 1906. A continuation.

Clute, W. N. *The Moonwort,* illust. Fern Bulletin, July, 1906.

Davenport, G. E. *The Forms of Botrychium simplex.* Fern Bulletin, July, 1906. Distinction of the variety *fallax.*

Dowell, P. *Distribution of Ferns on Staten Island.* Proceedings Staten Island Association of Arts and Sciences, January and May, 1906. A list of species with notes.

Druery, C. T. *Lomaria spicant bipinnatum in America.* Fern Bulletin, July, 1906. From Vancouver Island.

Hans, A. *About Abnormal Ferns,* illust. Horticulture, May 12, 1906. Illustrations of aberrant *Athyrium filix-fœmina.*

Klugh, A. B. *The Fern Flora of Ontario.* Fern Bulletin, July, 1906.

Lee, Dr. E. L. *The Hart's-tongue Fern in Tennessee.* Fern Bulletin, July, 1906. Description of the station near South Pittsburg.

McNeill, L. H. *Botrychium Biternatum.* Fern Bulletin, July, 1906. Habits of growth in this species.

Palmer, W. *Green and Red Stiped Lady Ferns.* Fern Bulletin, July, 1906. An inquiry as to the cause of the difference in color with suggestions for study.

Sanford, Mrs. J. R. *A Station for Asplenium ebenoides in Massachusetts.* Rhodora, June, 1906.

EDITORIAL.

The removal of this magazine to its new home in Joliet, Ill., was a bit larger undertaking than we had anticipated and it is quite likely that this number may be somewhat delayed. For the first time in some years the editor and the magazine are now in the same town, and we expect everything to work better in consequence. Delayed numbers should be out of the question in future. The next volume of this magazine is expected to be of unusual excellence, in fact to be by far the best volume we have ever issued. We trust that all our subscribers will promptly renew and that they will induce their friends to do likewise. We are sending a bill with this number to all whose subscriptions have expired and if any do not care to receive the magazine longer we request that notice be sent to us at once. It is a rare thing, however, for a person interested in ferns to stop his magazine. Many of our subscribers have been with us from the beginning, fourteen years ago, and many others expect to be with us for some time longer, at least, for there are subscriptions on our books that are paid up to 1910.

⁂

In July this magazine was packed for shipment to Joliet, and a great share of the back numbers are still in the packing cases. This has prevented us from sending sample copies as requested during the past few months, but a sample of this issue is sent to all who applied and we earnestly solicit their subscriptions.

⁂

While we have always felt that too much may be made of the forms of ferns from the standpoint of the systematist, we are not blind to the fact that such forms occur in nature and as such are well worth attention. Fern illustrations, however, have usually depicted the normal fronds and for this reason we have begun in this number a series of illustrations of the rare forms which we purpose continuing through the next volume. We wish especially to illustrate those named forms which have never been figured and invite our readers to send us specimens of such forms, from which drawings can be made. As a general thing the crested and forked forms are so much alike that we do not care to figure them, but any other curious forms we shall be glad to receive.

* *
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No title-pages and table of contents have yet been printed to volumes 12, 13 and 14 of this magazine, but these are ready for the printer and as soon as issued will be mailed to all subscribers. At the end of next year we also plan to issue a five-year index exactly like the ten-year index to the earlier volumes which has achieved a deserved popularity. If our readers have not seen this ten-year index we shall be glad to send them a copy for twenty-five cents, and this cost may be deducted from any order for back numbers that they may later send us. The index is practically a reference list to all that was published about ferns in America from 1893 to 1903. A word may also be said about the back numbers. Volume six is practically out of print. We still have a few volumes left, but they will probably be gone within the year. The increasing value of these back numbers is beginning to be properly appreciated for we have sold more during the past year than in any two years previous. Those who are specially interested in ferns should get a set while they can. The literature of ferns is so limited that anyone can afford to have a complete collection. It is not merely to sell the back numbers that we urge the purchase of full files; we are also interested in the spread of a knowledge of ferns. Nor do we like subscribers to have incomplete volumes. If your set lacks a number here and there, let us know what numbers are missing before too late and we will replace them free. All who have recently asked for missing numbers should receive them with this issue of the magazine.

* *
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From the viewpoint of the radical botanist these are the days in which history is being made. On all sides we see evidences of the desire to change the names of plants merely for the sake of change. The only excuse for giving a new name to a well-known plant that should be considered valid is that it will aid the scientist in studying it. And yet we constantly find botanists struggling for mere change; some raising sections to generic rank, some making so-called species out of varieties or forms, others digging up forgotten generic and specific names, and still others subdividing genera into new genera of their own. When business gets dull, a few botanists get together, make some rules useful to their purpose, and begin the game all over again. We are forcibly reminded of this by some recent publications, in one of which we find that the genus *Agaricus* no longer includes the familiar mushroom, but is now used for a shelf-fungus! Among ferns, *Didymoglossum* has tried to crowd out *Trichomanes,* and *Actinostachys* has designs upon *Schizæa.* Less than ten years ago, *Aspidium trifoliatum* went unchallenged in every book. Later it was introduced into the society of those who favor a "stable" nomenclature and baptized *Tectaria trifoliata.* But the motto of the "stable" nomenclaturists is change, and the plant is at this writing to be known as *Tectaria heracleifolia,* the name *Tectaria trifoliata* having departed attached to some overlooked form in the West Indies. Its orbit has not yet been calculated, and therefore it is not known whether it will return to again perch upon our species; but if it does, we need not look for it under the name of *heracleifolia.* Some other name will undoubtedly be found for it soon. For ourselves, we purpose waiting about one hundred years before we take up any more of this nomenclature nonsense, and in the meantime shall call the species by the good old names in use when every fern student could recognize them at sight, and when new facts and not new names were the objects of a fern student's attention.

BOOK NEWS.

The title "How Ferns Grow," * selected for a new book by Margaret Slosson, is a bit misleading. This is not a treatise on the life processes of the ferns, but a series of forty-six plates illustrating the forms assumed by eighteen ferns from the sporeling stage to maturity, with more or less explanatory text. All who are interested in the development of fern fronds will find this a most attractive book, though they will doubtless regret that all the ferns of our region were not selected for treatment. The illustrations are by far the best part of the work, however. The rootstock, leaves, venation, sori, spores and habitat of each species are described with great prolixity and in the less technical parts, the author's style is so obscure or involved as not to be readily understood. A fondness is exhibited for the possessive plural in such terms as Species', Plants', Segments', etc. *Asplenium ruta-muraria,* one of the best-known species on both sides of the Atlantic is re-named *Belvisia ruta-muraria* because Neuman separated it from the other *Aspleniums* more than sixty years ago. The publishers have done their part well, though the excellence of the illustrations is marred by the evident fact that the originals were cut out of herbarium sheets in irregular pieces and photographed. The nomenclature is "in accordance with the American Code," whatever that may be.

* "How Ferns Grow," by Margaret Slosson, New York; Henry Holt & Co., 1906. 8vo. Pp. 156. $4.00.

There comes to us annually from Dr. C. Brick, St. Georgskirchhof 61, Hamburg, Germany, a separate from the *Botanischen Jahresbericht,* containing the title and a summary of the contents of every article on the Pteridophytes published anywhere during the year. While a great part of the summary is in German and therefore not available to some fern students, we regard it as one of the most desirable publications for those interested in the literature of the fernworts. We do not know whether this part of the work can be purchased separately, but if so, we are of the opinion that many of our readers will find it a desirable possession.

Dr. E. B. Copeland has published in a report of the Government Laboratories of the Philippines, a list of "The Polypodiaceæ of the Philippine Islands," which will form a most valuable handbook for all who may have occasion to collect ferns in the islands. The author has sensibly concluded not to unnecessarily hamper fern students by new and strange names and has used a conservative nomenclature. The price of the Bulletin is fifty cents and it may be had from the Superintendent of Government Laboratories, Manila, P. I.

AMERICAN FERN SOCIETY

Mr. Henry W. Merrill, Hiram, Maine, has joined the Society since the last report.

President Ferriss left Joliet on October 8 for a two months' trip for ferns and land snails, to the Grand Canyon of the Colorado. He is accompanied by H. A. Pilsbry of the Philadelphia Academy of Sciences.

Dr. Dana W. Fellows, Portland, Maine, offers fronds of *Nephrodium fragrans* and *Polystichum Braunii,* collected in Maine to such members of the Society as desire them. Postage on either specimen will be three cents or both for five cents.

ABOUT THE FERN BULLETIN

In offering back numbers of *The Fern Bulletin* for sale, we are not attempting to get rid of some surplus stock. We print hundreds of extra copies of each number for the express purpose of supplying new subscribers with the numbers issued before they became acquainted with the magazine. The great demand for these is shown by the fact that the first five volumes are out of print, volume 6 nearly so, and other volumes are becoming scarce. The illustrations and articles in these numbers are not only still of interest, but *they are becoming more valuable with age.* The price of each volume is 75c. except volume 6, which is $1.00. Volume 6 is not sold separately except to complete files of our subscribers.

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